

COMPTON'S PICTURED ENCYCLOPEDIA AND FACT-INDEX

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*To inspire ambition, to stimulate the
imagination, to provide the inquiring
mind with accurate information told in
an interesting style, and thus lead into
broader fields of knowledge — such is
the purpose of this work*

VOLUME 6

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Here and There in This Volume



AT ODD TIMES when you are just looking for “something interesting to read,” without any special plan in mind, this list will help you. With this as a guide, you may visit far-away countries and watch people at their work and play, meet famous persons of ancient and modern times, review history’s most brilliant incidents, explore the marvels of nature and science, play games—in short, find whatever suits your fancy of the moment. This list is not intended to serve as a table of contents, an index, or a study-guide. For these purposes consult the Fact-Index and the Reference-Outlines.

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Key to Pronunciation

Pronunciations have been indicated in the body of this work only for words which present special difficulties. For the pronunciation of other words, consult the Fact-Index. Marked letters are sounded as in the following words: *cāpe, āl, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dā; cūre, būt, rŭde, full, bŭrn; ū* = French *u*, German *ü*; *gem, gō; thin, then; ñ* = French nasal (*Jean*); *zh* = French *j* (*z* in *azure*); *κ* = German guttural *ch*.



GAL'AHAD. Of all the knights of the Round Table, according to the Arthurian legends, the noblest was Sir Galahad, whose faith and purity of life gave him powers denied to others. It was this spiritual strength that enabled Galahad to find the Holy Grail, the cup used by Christ at the Last Supper. This sacred vessel, according to the story, had been brought to Britain by Joseph of Arimathea, but when the land fell into wickedness it was hidden away; and the search for it became the noble quest of the knights of King Arthur's Round Table.

One day, when the knights were talking of the Holy Grail, the torches in the great hall went out. Across the darkness streamed a band of silver light. Against that, faintly as through a mist, they saw a flush of rose. Only Sir Galahad saw the sacred cup clearly—"all crimson and glowing like a ruby," and heard a voice which said, "Galahad, follow me."

All the knights of Arthur's court swore a vow to live a holy life for a year and a day, while they searched for the lost Grail. Only four returned. Sir Bors and Sir Lancelot had seen the Grail in blessed visions. Sir Perceval had seen it because he was Galahad's friend, and next to him the purest in heart. After long wandering he had found Galahad in prayer in a hermit's cell, "clad in silver armor, and with a face like an angel's."

"Oh, my friend," said Galahad, "the Holy Grail shines always before me, blood red, and glowing like a star, guiding me to Heaven. It gives me victory over every sin and shame and wrong in the world. Come with me."

They went out into a storm, and over a hill top. Galahad ran before, across a bridge which spanned a black marsh, to the sea, and was seen no more. As Perceval knelt, weeping and praying, there came the beam of silver light, and on it the glowing Grail.

In the morning he found Galahad's body, beautiful, thin and worn as a saint's, and buried it by the sea.

"Because of pious zeal, repentance of sins, and goodness," said King Arthur, "three of you have had a vision of the Grail. But only Galahad really found the sacred cup."

The story of Sir Galahad is treated in Malory's 'Morte d'Arthur' and in other medieval romances. It is also the theme of Tennyson's 'Sir Galahad', and 'The Holy Grail' in his 'Idylls of the King'. (For other stories see Arthur; Round Table.)

GALILEO (gäl-i-lē'ō) (1564-1642).

The first astronomer to use the

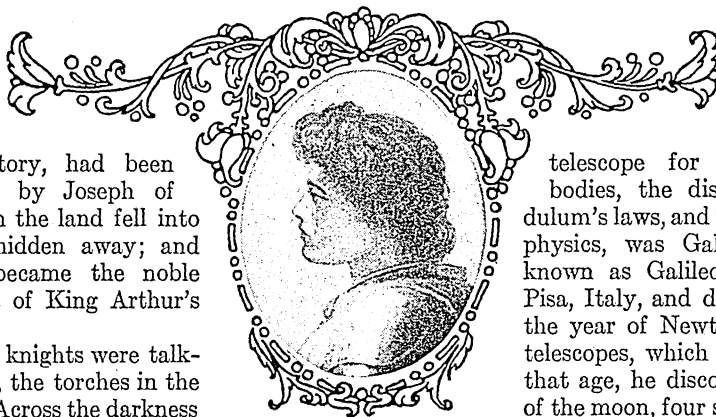
telescope for examining heavenly bodies, the discoverer of the pendulum's laws, and the founder of modern physics, was Galileo Galilei (usually known as Galileo). He was born in Pisa, Italy, and died 78 years later, in the year of Newton's birth. With his telescopes, which were the wonder of that age, he discovered the mountains of the moon, four satellites of the planet Jupiter, and the peculiar appearance of Saturn which was later shown to be due to a great ring, or a series of rings, surrounding that planet.

When Galileo was a youth of 19 he saw a lamp in the cathedral at Pisa

swinging regularly. He realized—what no one had realized before—that a pendulum swinging to and fro could be used to measure time, and so laid the foundation for the invention of the modern clock (see Pendulum). By dropping objects from the leaning tower of Pisa he also proved that falling bodies, however heavy or light, fall at the same rate (see Gravitation).

Galileo was a brilliant scholar with a quick and penetrating mind. He held the professorship of mathematics in the universities of Pisa and Padua; but in 1610 he left Padua for Florence, where he lived most of his remaining years.

Galileo made his first telescope with a piece of organ pipe, placing a lens at either end. It only magnified three times, but later he made a telescope that magnified 30 times (see illustration with Astronomy). With these he saw the mountains on the moon's surface, found that the milky way was a mass of very faint stars, and discovered the four largest satellites of the planet Jupiter. What he saw through his telescopes also convinced him of the truth of Copernicus' view that the earth rotates on its axis and revolves around the sun, and his ardent support of this view was the cause of difficulties with the church. In 1616 he was



*"My strength is as the strength of ten,
Because my heart is pure."*

—Tennyson.

given a formal warning, but nevertheless he again provoked the indignation of the church authorities by publishing a dialogue on 'The Great Systems of the Universe', which offended by its misuse of Holy Scripture as well as by its biting satire.

For this publication he was summoned before the Inquisition, in October 1632. No one knows what

happened in the construction of the microscope. Not only was Galileo one of the main founders of modern science by virtue of his important discoveries, but also by virtue of his methods. Rejecting the authority of Aristotle, he insisted on observing things for himself, and based his deductions on actual tests and mathematical analyses. This is the true spirit and method of all our modern experimental science.

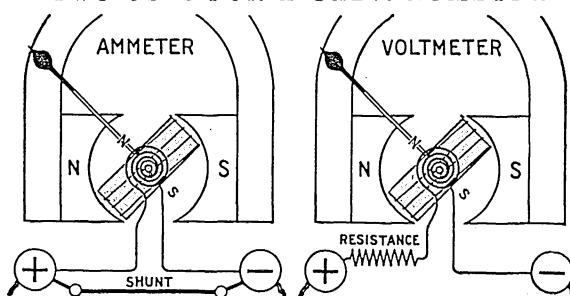
GALVANOMETER. On the dashboard of every automobile is an instrument that tells when and how much the battery of the car is charging or discharging. This is an *ammeter* and, like the ordinary *voltmeter* and *wattmeter*, it is a member of the galvanometer family.

Most of these instruments for use with direct current are built on the D'Arsonval principle. A small coil of fine wire is pivoted between the poles of a permanent magnet. Two small springs hold this coil in a neutral position and also serve to carry current to it. When current passes through the coil the latter becomes an electromagnet (*see Magnet*), whose north and south poles are repelled by the adjoining poles of the permanent magnet, as shown in the accompanying picture, then attracted by the opposite poles, if the coil is moved far enough. This causes the coil to turn on its pivots against the pull of the springs. The degree of this movement, usually indicated by a pointer and scale, is a

measure of the current.

The ordinary ammeter is a galvanometer connected in series with the circuit to be measured. Most of the current passes through a strip of metal called a shunt, but the small part that goes through the resistance

TWO USES FOR A GALVANOMETER

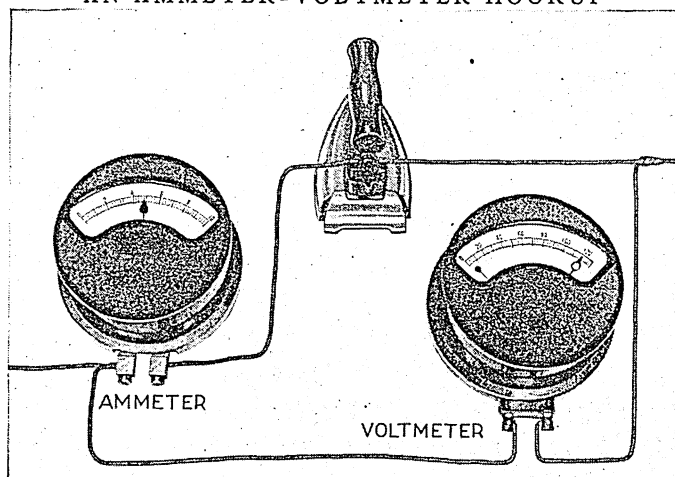


Here you see the coiled wire, coiled springs, magnet, pointer, and scale described in the text as making a direct current galvanometer. Note how a shunt makes the instrument an ammeter, while a high resistance makes it a voltmeter.

offered by the moving coil is always a proportional measure of the main current. The voltmeter is a galvanometer of very high resistance. It is connected across (in parallel with) the circuit, so that the current it allows to pass is proportional to the voltage.

For use with alternating current, the permanent magnet may be replaced by a fixed coil which takes current from the same circuit as the moving coil. Since the polarity of the fixed coil alternates at the same instant as that of the moving coil, the direction

AN AMMETER-VOLTMETER HOOKUP



This picture shows the correct way to test the voltage and amperage taken by an electric iron operating on a household direct current. The current flows in from one margin of the picture, through the ammeter (series connection) and the iron, and off at the other margin. The voltmeter is shunted around the apparatus—that is, it is connected in parallel.

happened during his examination, but we do know that he uttered a formal recantation of his views and was compelled by the tribunal to live in strict seclusion for the rest of his life. There is a story that as he rose from his knees he whispered defiantly, "Nevertheless it does move,"—referring, of course, to the earth; but this is a fiction invented more than a century later.

During the last eight years of his long life Galileo lived in retirement near Florence, but his interest in science never waned. His most admired and perhaps most valuable book, 'Discussions of the New Sciences', was published during this period. In this work he summarized his lifelong studies on the principles of mechanics. Only when blindness overtook him in 1637 did Galileo lay aside his telescope. Still continuing his scientific meditations, he dictated notes and correspondence almost to the day of his death, Jan. 8, 1642. He was buried at Florence in the cathedral of Santa Croce, where an impressive monument commemorates his brilliant researches.

Galileo achieved his greatest reputation as an astronomer, but it is probable that his chief service to science lay in establishing certain fundamental principles of dynamics, such as the law of falling bodies, the discovery that the path of projectiles is a parabola, the demonstration of the laws of equilibrium, and an account of the true principle of flotation. He also devised an elementary form of the thermometer, invented the hydrostatic balance for determining the specific gravity of solid objects, and made improve-

of the magnetic action remains constant. A cheaper instrument consists of a fixed coil which draws a light iron core inward regardless of the direction of the current. In the "hot-wire" ammeter the expansion of a fine wire as the current heats it moves a pointer over a scale.

In a wattmeter a fixed coil is connected to the circuit in series and a moving coil in parallel. The resultant movement of the needle depends on both the amperage and the voltage, thus giving a reading in watts.

GALVESTON, TEX. In 1900 the city of Galveston—which is now one of the largest seaports in the

and now Galveston is famous as a seaside resort, attracting nearly a million visitors every year. Two great causeways for vehicles and a railroad bridge connect the island with the mainland. Fort Crockett, a coast artillery post, is located in Galveston. The new "commission" form of government, which in the crisis was devised to supplant the old inefficient system, proved so satisfactory that it has been widely copied (*see* Municipal Government).

Many millions of dollars have been spent by the United States government and by the city on harbor improvements. Granite jetties 12 miles long at the harbor entrance maintain a 31-foot channel. Thirty

huge piers can berth over one hundred steamships at a time, with warehouse and transfer facilities. The industries include marine iron works and ship repairing, rice and flour mills, soft drink manufacture, meat packing, and cotton and cottonseed-oil mills. The city is built on the east end of the island of Galveston, which is 30 miles long by 2 miles wide. Population (1940 census), 60,862.

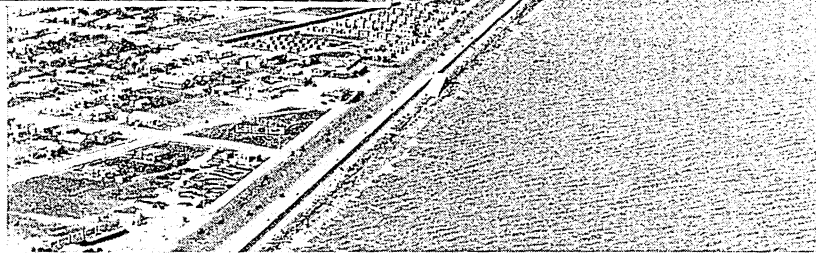
HOW GALVESTON HARNESSSED THE SEA



United States and one of the world's great cotton exporting ports—suffered one of the worst disasters in American history. On September 8 of that year a West Indian hurricane, blowing 120 miles an hour, struck the island on which the city stands, and in a few hours practically destroyed it, while huge waves swept in from the Gulf of Mexico, drowning some 5,000 people.

But Galveston, like Holland, refused to yield to the ocean. The people immediately set about building a gigantic concrete sea wall, 17 feet above low water, 16 feet thick at the base, and 7½ miles long. Houses were put on stilts and car lines were elevated, while the whole city was raised to the height of this wall by pumping in nearly 20 million cubic yards of sand from the bed of the ocean.

These improvements brought other advantages besides safety from the sea. The higher level and resulting better drainage improved health conditions,



At the left is the superb modern harbor of Galveston, with its "slip and pier" arrangement and excellent railroad yard layout. The channel to the Gulf is just visible at the top. To the right at the edge you see the sea wall, the boulevard behind it, and adjoining the pier, the resort center. This part of the island is opposite the "bend" in the harbor.

GAMA (*gā'mā*), VASCO DA (1460?-1524). For more than 60 years the Portuguese had been creeping down the west coast of Africa trying to find a route to India, and had reached the southern end in 1488, when Spain entered the race by sending out Columbus. Spain had, it seemed from his first reports, been successful in the contest when Vasco da Gama sailed from Lisbon in July 1497, in a final attempt to reach India by rounding Africa before Spain could establish trade by her supposed new route. He was selected to command the fleet of four small vessels—much like those

of Columbus—because he was “a discreet man, of good understanding, and with great courage for any great deed.” He was also “a gentleman of the king’s household, and of noble lineage,” and a skilled mariner. His voyage to India was a great feat of seamanship. The distance covered was three or four times as great as that to America, and the winds and currents he had to contend with were more difficult than those Columbus encountered. Like Columbus, he also had to contend with the timidity of his men.

After reaching Cape Verde on the west coast of Africa, Da Gama steered boldly for the Cape of Good Hope, called by his men the Cape of Storms. It required all of his resolution to keep his crews to their voyage after they had passed that point. Not if he were confronted with a hundred deaths, he said, would he go back a single yard, and he clapped the leaders of the mutiny into irons. On the east coast of Africa, Da Gama met Indian traders who gave him a pilot for the rest of the voyage. In May 1498, ten months after he sailed from Lisbon, he landed at Calicut, on the west coast of India. His reception by the ruler of the city was not at all friendly, and after seeing enough to convince himself of the immense wealth of the country, he began his homeward journey.

When the few survivors—55 out of about 170—arrived in Lisbon in September 1499, they were given a splendid reception. Vasco da Gama was granted the coveted title *Dom*, while his pensions and facilities for trade with the Indies made him one of the richest men in the kingdom.

In February 1502 Dom Vasco da Gama set sail a second time for India, and returned in September 1503, with the first tribute of gold from the East. In spite of the part he had played in gaining a foothold for Portugal in the East, it was not until 1524, when he was more than 60 years old, that he was appointed governor or viceroy of the country. Old as he was he set out energetically to reform abuses in the government, but within a few months after taking office he died.

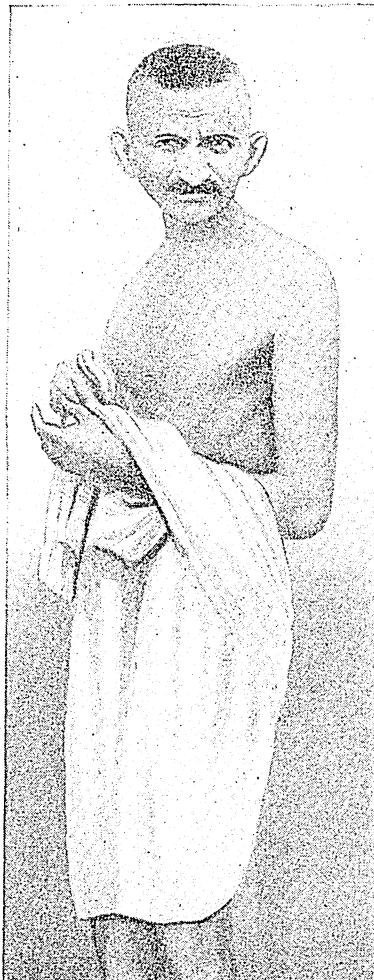
His successful voyage to the East had brought to his country immense wealth and made her one of the foremost powers of Europe, because she now controlled the route to the Indies. As Columbus opened the way to the West and its ultimate wealth, so Da Gama, in the same decade, opened the way to the East and its immediate riches.

GANDHI (*jūn'dē*), MOHANDAS KARAMCHAND (born 1869). Saint, ascetic, political leader, and religious prophet, Gandhi is India’s best known and most influential citizen. By his millions of followers he is called “Mahatma”—the Great Soul. This Hindu apostle of *swaraj*, or home rule, is a frail little man of only 90-odd pounds, but he has so impressed the world by his courage, sincerity, and intense patriotism that even people who disagree with his political and economic ideas are outspoken in their respect for him.

Gandhi was the son of an important native official at Porbandar, in the Bombay area. At eight years of age he was betrothed, and at twelve, married, as is usual in India. After attending an Indian high school, he studied law at the University of London and the Inner Temple. He began his legal career in Bombay, and after a visit to South Africa in 1893 settled there and soon built up a rich practise. In 1894 he founded the Natal Indian Congress and began agitating both in South Africa and India for Indian rights in the South African colonies. In 1899, during the Boer War, he offered his services to the South African government, raised an ambulance corps, and served in several actions. Similarly, in 1906, he served the government during the so-called “Zulu revolt.” For these services he received medals and other marks of recognition. He gave his time freely to anti-plague work, to promotion of peace between capital and labor, and to improve race relations. The influence of Ruskin and Tolstoy became a decisive factor in his life. He finally renounced his law practise and took a vow of poverty.

In 1906, during the agitation in South Africa for a law excluding Asiatics, he led in a “passive resistance” struggle, and was twice imprisoned. Nevertheless, at the outbreak of the World War he went to England and raised an ambulance corps, mainly of Indian students. Later he returned to India and was recruiting volunteers when news of the armistice came.

Gandhi had hoped by these evidences of loyalty to secure full equality in the British Empire for his country. But a series of unfortunate events in 1919 dashed these hopes and precipitated a more or less violent campaign for self-government. Gandhi became its chief leader. For several years he had been gradually gaining a hearing among all classes of Indians through his writings and his reputation as a saint. Although born a Jain, the strictest sect of India, he developed



MAHATMA GANDHI

a tolerance which embraced men of all faiths and led him to work for good-will and common understandings, particularly between the fiercely intolerant Hindus and Mohammedans, as a first step toward self-government. This tolerance also caused him to advocate improving the conditions of the so-called "pariahs," or outcaste classes. The spinning wheel became the symbol of his aims—freedom from Great Britain and from the influence of machine civilization.

To achieve these ends, Gandhi carried on a personal, dramatic struggle against British authority which won world-wide attention. In 1920 he launched a campaign of "passive resistance"—non-coöperation with the government, including a boycott of British goods, but without violence. But in 1922 the campaign collapsed and Gandhi served two years of a six years' sentence of imprisonment.

In 1930, after a period of retirement, Gandhi led a spectacular "march to the sea" in protest against the government's tax on salt. Imprisoned for several months, he became once more a popular hero. In 1931 he took part in the London Round Table Conference on India. After the conference broke down, however, he revived the civil disobedience campaign. He was jailed again in 1932, but, when he entered upon a "fast unto death," he was released. Even though he resigned from the Indian National Congress, which he led for a number of years, his sway over India's masses remained as powerful as ever.

This was demonstrated when war broke out between Great Britain and Germany in 1939. Gandhi, then 70 years old, virtually dictated Indian policy during the crisis. As the price of India's allegiance, he demanded immediate self-government. When this was refused, he urged a policy of non-coöperation in the war and later a campaign of civil disobedience. When riots and disorder began in August 1942, Gandhi was placed under arrest with other Indian leaders (*see* India). **GANGES** (*gān'jēz*) RIVER. Born in northern India in an ice cave beneath the Himalayan snows, the Ganges, the sacred river of the Hindus, breaks through the last mountain barrier just above ancient Hardwar. A shallow, rapidly falling stream before it gains the flow of its many tributaries, the river keeps to a southeasterly course through the land of the little talkative Jats, busy in *gram* (chick-pea) and indigo fields, to Cawnpore, that blackest spot on the Indian conscience. For here on a flight of steps, Massacre Ghat, leading down to the Ganges, 600 women and children were killed during the Indian Mutiny of 1857.

When one-half of its journey through the most densely populated region of the world is done, the Ganges is joined by a sister stream, the Jumna. Their *doab* (land between two rivers) is irrigated by two elaborate and costly canal systems fed from the Ganges. Allahabad, on the point of land thrust out into their united swirling waters, is a holy of holies to the Hindus, the true place of pilgrimage, where the festival known as the "Maghmela" is held. Here the river becomes deep enough to bear all sorts of small

native craft, and it is navigable throughout the remainder of its 1,550-mile journey to the sea.

In a great circle the powerful stream sweeps past Benares. The banks are crowded with temples, whose *ghats* (steps) creep with pilgrims of every caste and rank, struggling to wash away their sins in "Mother Gunga," to cast the ashes of their dead into its current, or to capture a small vial of its purifying liquid to carry back to distant homes.

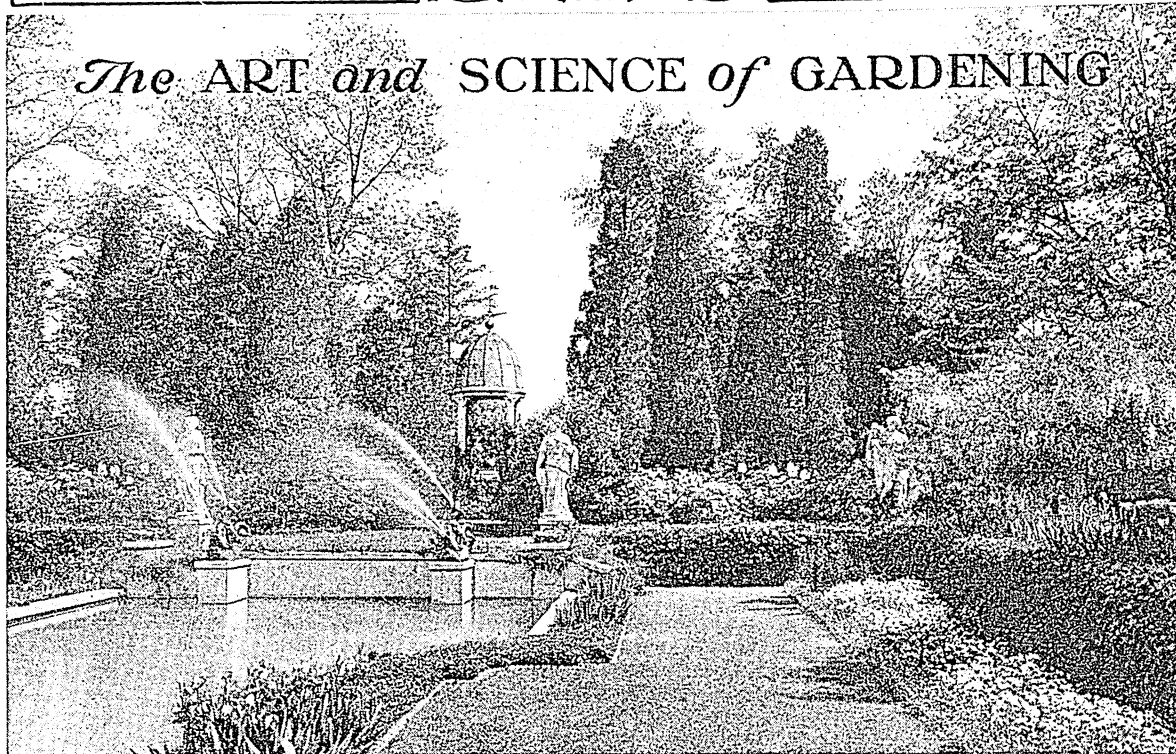
Swelling with the force of new tributaries, it flows past village and city until it meets the powerful Brahmaputra, whose black load of silt assists in the unceasing building-up of its extensive delta. This delta begins more than 200 miles from the Bay of Bengal, and the river stretches myriad fingers of tiger-infested crocodile swamps southward to the sea. Chief of its channels is the Hooghly on the west, bearing majestic ocean liners 80 miles to busy Calcutta. Here the stream is choked with narrow native canoes with tiny deckhouses, and fat barges topped by bamboo cottages, unloading the plentiful output of India's plains. Constant dredging is needed to keep the channel free of silt.

India worships "Mother Gunga," just as ancient Egypt deified the Nile, because it gives life to the millions that swarm the 390,000 square miles of its fertile basin. When the tropical summer rains beat down, every tributary of the Ganges rolls in a swelling flood down to the holy river. The muddy waters creep across the broad flood plain, mile upon mile, deepening to 60 feet in places. When the rains have spent their force, the deluge recedes, leaving a new layer of rich soil on millions of tiny farms. Rice, wheat, cotton, jute, spices, and other crops spring from the soft warm loam, feeding almost as many people as live in both North and South America, and sending rich exports around the world.

GANNET. While the snow still clings to the cliffs of Bird Rock and Bonaventure Island in the Gulf of St. Lawrence, large sea birds come in wheeling flocks to build their nests on the wind-swept ledges. They are gannets (*Sula bassana*), magnificent in pure white plumage and black wing-feathers, measuring about 35 inches in length. This species, which also nests on several islets off the coast of the British Isles, is the only northern representative of the gannet and booby family *Sulidae*, the remaining ten species being distributed over tropical and subtropical coasts. Gannets and boobies are sea dwellers and fishermen by trade. The booby (*Sula leucogastra*), found on the Bahaman Keys in large colonies, and the red-footed booby sometimes visit the coast of Florida.

GANYMEDE. According to a Greek myth, this beautiful youth, the son of King Tros, attracted the notice of Zeus, king of the gods, who determined to make him his cup-bearer to succeed the goddess Hebe, and so sent his eagle to carry him off to heaven. Zeus gave Tros a pair of divine horses and comforted him by telling him that his son was now immortal. Ganymede was a favorite subject of ancient art.

The ART and SCIENCE of GARDENING



Spraying fountains, classic statues, and a marble pool, bordered by blue iris and blue and purple pansies, are the characteristics of this garden. A masterpiece of the landscape architect, it represents formal art rather than nature.

GARDENS AND GARDENING. "God Almighty first planted a garden: and indeed it is the purest of human pleasures." This saying of Lord Bacon has been found true by multitudes of garden-lovers since the time when recorded history began. Magical gifts are produced in your garden that cannot be bought at any price—health, wholesome delight, and habits of thrift, industry, and perseverance. No investment on the stock market can rival Nature's return, for she gives you back "a hundred fold."

Gardening in its various forms, ranging from the small vegetable or flower garden to the great parks and estates created by the landscape architect, was practised by the Egyptians, the Persians, the Assyrians, the medieval monks, and the princes and kings of all ages. Today the love of the garden has been brought down to the humblest home fortunate enough to have a few feet of ground in which plants may be raised. Garden making has become a sign of good citizenship and a stamp of social standing. The home builder plans the living surroundings of his home with the same care and taste that he applies to furnishing and decorating its interior.

The home vegetable garden may bring you vegetables of a quality and a flavor far superior to that of the vegetables you buy at the market. A plot 20 feet square and a cash expenditure of \$5 for seed and fertilizer will yield fresh vegetables approximating a value of \$50. The flower garden and the artistically landscaped home grounds give you beauty on which to feast your eyes, both in and out of doors.

The rewards of home gardening are much bigger than mere dollars and cents. As one garden-lover says, "Your chief joy in your garden will not be in the vegetables that you eat, nor in the flowers that you pick, but in the satisfaction of causing things to grow. You will enjoy the companionship of things that are real and clean. You will come to know the common and the little things. Just to have handled the new earth, and to have sown the seed, and to have thought about the garden at morning and at night—this is worth the effort. You have come nearer to nature."

Selecting the Vegetables to Plant

The home gardener who is raising crops to be harvested within a few feet of his own door can overlook the requirements of the truck gardener, who has to select varieties that are easy to handle, transport, and store, and hence sacrifices delicacy of flavor to toughness of fiber. The small gardener should choose his crops on this basis: (1) Relative popularity of the vegetable. (2) Ease of culture. (3) Returns for space and labor. (4) Table usefulness and food value of the crop. Bush beans, corn, peas, tomatoes, lettuce, onions, radishes, beets, and carrots are the most important vegetables suitable for the small garden.

Whether we are planning to build a vegetable or flower garden or to landscape the surroundings of the home, the initial steps in garden making are the same. The ideal garden plot is one that is open to sunlight but protected from drying and cold winds. Where possible a general slope to the south is beneficial. No green plants can live without sunlight, and with few

exceptions, they demand actual sunlight for at least part of the day. Avoid placing the garden where it will be continually shaded by buildings.

The soil is the foundation of the garden. On the basis of whether they are easy or difficult to work, soils are roughly classed as light or heavy. Light soils contain a large percentage of coarse-grained sand, and are therefore loose and easily worked. Clay is hard to work because it is very fine grained and holds great amounts of water. Such a soil can be improved by the addition of sand and decayed vegetable matter.

How to Prepare the Ground

Before planting, the soil must be well spaded or plowed, so that the plant roots may penetrate easily and so that water and air may pass through. This may be done either in the fall, or in the early spring after the winter's snow and frost have disappeared and the ground is dry enough to crumble when it is worked. Among the advantages of fall plowing are the following: (1) It gives the turned-under vegetable matter a longer time to decay. (2) It makes it possible for us to start our gardens earlier in the spring. (3) Heavy soils are made more friable by being exposed to freezing and thawing. The small garden plot should be spaded and pulverized to a depth of two feet or more. This deep tillage of the seed-bed aerates the soil and lessens the need for constant watering. Only after the soil has been raked and made smooth and level are we ready to start planting. Carelessness in preparing the seed-bed is one of the most common causes of garden failures.

Plants, like children, require a well-balanced ration of food in order to thrive. The soil is their cupboard, and this must be well stocked to produce the best crops. There are three elements in the soil necessary for plant growth that often need to be increased. These are nitrogen, phosphorus, and potassium. The materials we use to supply these elements are called fertilizers. Barnyard manure supplies these foods and also adds humus or organic matter. The latter makes the soil light and loose so that the plant roots may penetrate easily, and also helps retain the water in the soil.

Standard commercial fertilizers, containing about 4 per cent nitrogen, 12 per cent phosphorus, and 4 or 5

per cent potassium, may be substituted if barnyard manure is not available, using about one pound of fertilizer for every 30 square feet of land. If commercial fertilizers are used, as much vegetable matter as possible should be added to the garden soil every year to maintain the supply of humus. Rye planted in the fall, after the crops are harvested, and plowed under in the spring will supply this vegetable matter. Lime is added to correct the acidity of the soil, but gardens should not be limed unless tests show that it is needed. If beets grow well in the garden, lime is probably not needed. Lime is also added to improve the physical character of some heavy soils such as clay. In this instance about 30 bushels to the acre are used. (See Fertilizers; Soil.)

It is good practise to make a rough plan of your garden on paper before planting. In arranging the different crops in the seed-bed the following hints should be considered: (1) Perennials, that is plants that live on and continue to produce flowers, fruits, and seeds from year to year, should be placed to one side so that they will not interfere with the yearly plowing and cultivation of the seed-bed. (2) Spreading plants, including melons, cucumbers, squashes, pump-

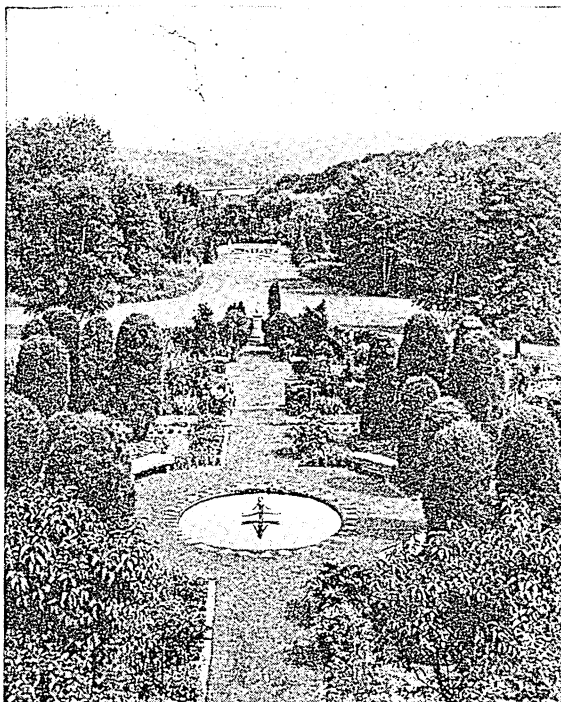
kins, and tomatoes, should not be permitted to overrun smaller crops. (3) Tall plants should not overshadow shorter ones.

When to Plant

There are two important planting times, spring and fall. Annual vegetable and flowering plants—those that bloom and produce fruits and seeds in a single season—are usually planted in the spring, but almost any annual which is self-sowing can be seeded in the fall. Annual flowers, especially poppies, cornflowers, larkspur, and even sweet peas will bloom much earlier if planted in the fall. Plants that are propagated by means of bulbs, such as daffodils, narcissi, tulips, and others, are planted in the fall if they are to bloom during the following spring. February and March are the months in which to plant

early flowers and vegetable seeds indoors or in hot-beds or cold-frames. Tomato seeds should be planted from eight to ten weeks before the plants are to be placed in the garden, and pepper and early cabbage seeds from six to eight weeks. Petunia, verbena, pentstemon, lobelia, snapdragon, and other flower seeds

A FORMAL TREE-FRAMED PICTURE



Patrician in every detail is this garden with its long vista of gravel walk, marble benches, sun dial and circular pool, closed in by sculptured greenery.

that require a long time to germinate should be planted before the end of February.

For indoor planting a warm room and a sunny window with preferably a south or east exposure are required. A shallow wooden box or tin pan with holes punched in the bottom for drainage will serve as a temporary home for the plants. The box or pan should be filled to a depth of about four inches with good garden soil. Starting plants in hotbeds or cold-frames, if these are available, is preferable to indoor planting. Not only can a greater number of plants be sown, but such quickly maturing crops as lettuce and radishes may be raised.

How to Transplant

Before the seedlings are transplanted to the garden they should be kept outdoors for a few days so that they will become accustomed to their new environment. The chief rules for transplanting are: (1) Select a cloudy day. (2) Give the seedlings a thorough watering before moving them. (3) Take up each plant carefully so that its roots will be disturbed as little as possible, and place it in the hole made with a small stick or dibble. (4) Plant the seedling slightly deeper than it grew before and press the soil firmly about its roots. (5) Water each plant thoroughly immediately after transplanting.

The natural time for any kind of transplanting is in the spring because then the plants are starting new growth and their active cell formation will repair damages to the roots. Transplanting trees, shrubs, and other perennial plants in the fall, however, is practical except in very cold or dry regions. In moving a plant always remember that it is a living thing and that cutting or breaking its roots may kill it. Evergreens and most other trees and shrubs should be handled with a large ball of earth around the roots to protect them. The hole into which the new plant is to fit should be made much deeper and wider than is necessary to accommodate the plant, and the bottom should be covered with fertile top soil. Spread the roots into their natural positions, and then gradually work in rich and well pulverized soil about the plant and roots. Put in small quantities at a time and press each layer in firmly. In dry weather particularly, and always with plants having big roots, it is better to wash the soil into position with copious waterings

from a hose. Fertilizer must never come in contact with the roots, so do not mix it with the soil used in transplanting.

"Plant thick and thin quick" is the colloquial expression of good garden practise. Plant vegetable and flower seeds thickly enough to give the garden the appearance of being well covered. As the plants develop, never permit them to crowd one another. Pick out the superfluous plants so that each remain-

ing individual will have plenty of room for full development. Consult the vegetable and flower charts at the end of this article for directions concerning the depth to plant various seeds, and the distance that should be left between different plants.

Annuals will give the quickest returns in the flower beds and are essential for carrying color and bloom in the garden in midsummer. But among the earliest and finest flowering plants are the hardy perennials, the permanent plants which should be a part of every garden. There are two general types of perennials: perennial shrubs with woody tree-like stems such as roses, and herb-like or herbaceous perennials in which the soft pliant foliage springs directly from the roots. In

the latter the stems and leaves are killed by frost each fall and are replaced by new growths each spring.

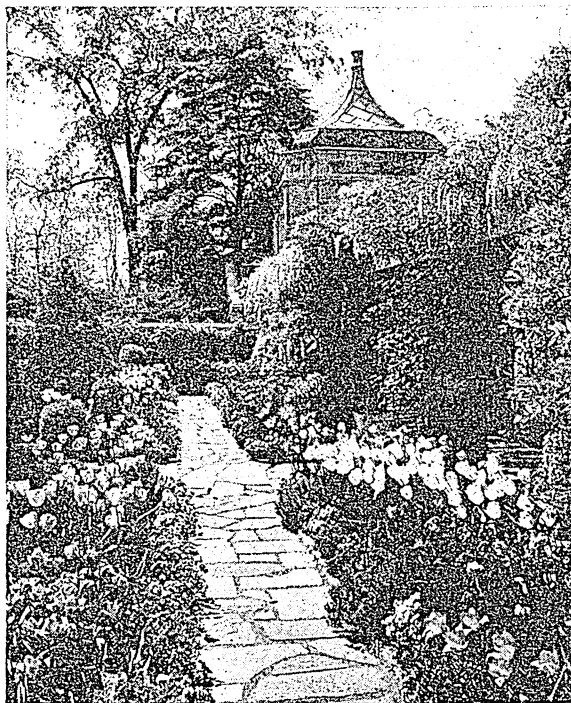
Herbaceous perennials are planted in the garden wherever they give the most pleasing effects. They may be planted with shrubs or intermingled with annuals in the flower bed. They are used very effectively to furnish a border fringing the side of the lawn or even surrounding it. Peony, iris, phlox, hardy chrysanthemum, aster, campanula, delphinium, day lily, lupine, gaillardia, and plantain lily are a few of the many reliable perennials that may be used in the herbaceous border.

Spring flowering shrubs, many of which also bear attractive fruit in the fall, will help to furnish the permanent garden. Plant these preferably in the background with the flower borders in front.

Landscaping the Home Grounds

The first step in beautifying the home grounds with flowers, shrubs, and trees is to work out a complete and detailed plan. To buy shrubs and flowers before working out a planting scheme would be just as foolish

TULIPS AGAINST A VINE-CLAD WALL



The "outdoor living-room" gains privacy if enclosed by a wall rather than a hedge. Here the tulip-bordered stone walk is set off effectively against the vine-draped garden wall.

as attempting to build a house by shopping for doors, windows, and lumber before drawing plans for the building. The purpose of home landscaping is to create a harmonious and beautiful setting for the house itself. Trees and shrubs should not hide the house; rather they should bring out its salient features and harmonize with its architecture. Not only in our plant arrangements should we strive for harmony, but also in our color schemes.

Fitting the Garden to the House

In relating the garden to the home there are three areas to consider: the front, the service, and the pleasure area, or "pleasance." The front and back lawns serve as the groundwork of the garden picture. It is generally preferable not to cut up the center of the lawn to make room for flower beds or other ornamental planting. A well-kept lawn is beautiful in itself. No matter how fine its architecture, the house is not complete without some carefully placed plant masses around its foundation to blend it with the landscape. Low growing shrubs should be planted in front of porches and under windows. Taller growing shrubs will give support to each end of the structure.

The service area in the back yard should be convenient to the service quarters of the house and preferably screened off by shrubs or other plants to add to the garden picture. The pleasure area should be designed in relation to the living quarters of the home. Draw imaginary vista lines from windows, doors, and porches to the most distant points of the available garden area, and keep these vistas free and open. Draw a rough plan of the

area with the vista lines marked on it and showing any other permanent features, such as garage or stable. Also lay out any necessary walks. Roughly draw ovals in each of the more or less rectangular spaces thus formed. This will give you a working foundation for the plantings. The centers of these ovals should be kept unplanted or practically clear. Paths should be straight wherever possible. The serpentine path is an irritation, but if introduced, each bend should be justified by some interfering object, such as a tree or a flower bed. Since the garden and dwelling form a picture, modern taste justifies a

permanent enclosure so as to give scale to the entire composition. This enclosure may be a wall or hedge.

The most common hedge material is privet, but arborvitae, white pine, spruce, lilac, or other shrubs that can stand shearing are equally suitable. Hedges should be planted in a deep trench well supplied with fertilizer. Each shrub should be planted deep enough so that the final branching will extend right down to the ground level. Hedges are pruned slightly wider at the base than at the top so as to avoid snow damage. The last pruning should be given about six or eight weeks before frost is expected. (See Hedges.)

Preparing a Good Lawn

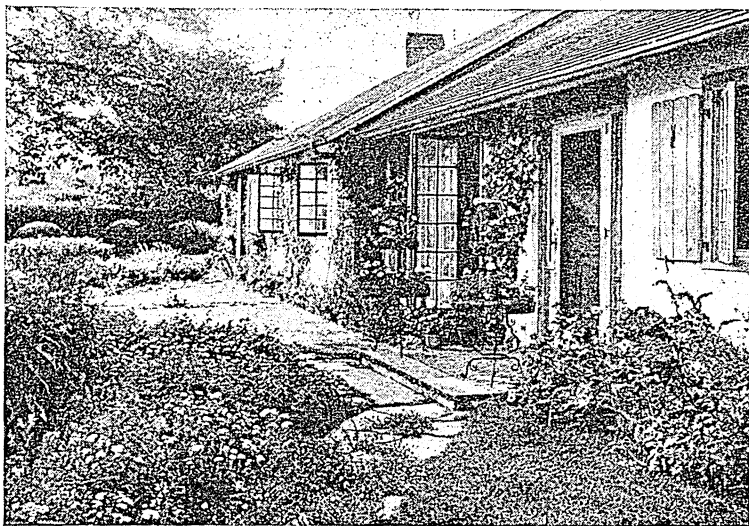
The best lawn grass is Kentucky blue grass, but it is safer for the average lawn maker to use a high quality lawn seed mixture as put up by established seed dealers. Such mixtures are more than 50 per cent blue grass, with other grasses that will germinate more quickly and give a green appearance to the lawn soon after seeding. The best time to seed a lawn is in late summer or early fall, but it is commonly done in the spring. The soil of the lawn area needs the same preparation as the soil of the garden itself. When turning the soil, add commercial fertilizer in the pro-

portion of ten pounds to a thousand square feet. Sow three to five bushels of seed to the acre; for small areas, four pounds to every thousand square feet. Roll the ground lightly after seeding.

Rockeries, pools, bird baths, sun dials, and other special garden features must be introduced with care. A combination pool and rockery usually works out well. A rock garden should not be a mere pile of rocks

adorned with a few flowers, but instead it should be a close imitation of a natural rock outcrop carefully planted with an interesting collection of rock plants. It is best placed at one corner of the garden in a realistic setting. Use old weathered rocks, all of one kind. The stones should be laid horizontally, not like spiked turrets projecting into the air. In building a rockery, make a mound of earth and then place the rocks in position on the mound, burying about two thirds of the stone in the soil. Each rock should be used as a support for the soil, and should be slightly tilted so that the water will drain backwards to the

GARDEN AND HOUSE IN HARMONY



This small simple cottage calls for just this type of surrounding garden, with its flagstone walks, its border of perennials, its low flowering shrubs, and the climbing roses of its walls. Modest informality and a spirit of care-free ease give the scene its charm.

FAVORITE BIENNIALS AND PERENNIALS EASY TO RAISE FROM SEED

These are best sown in early fall when they will flower the next year; but spring sowing is satisfactory for many of them. Make a seed-bed by forking up the soil at least one foot deep; level, smooth, and scatter seeds lightly on top. Water the bed the day before sowing. Sow in a cold-frame, if possible, and shelter it from the noonday sun. If sown in the open, shade with paper until germination takes place. Transplant, that is, "prick out," when seedlings make first pair of true leaves.

Name of Flower	Height, in Inches	Color of Flower	Distance Apart, in Inches		Depth to Sow (in.)	Month of First Flowering	Weeks in Bloom
			Pricking Out	Permanent Planting			
<i>Achillea filipendulina</i> (fernleaf yarrow).....	36-42	yellow	2	15	1-16	July and Aug.	4-6
<i>Achillea millefolium</i> (common yarrow or milfoil).....	18-24	white, pink	2	12	1-16	July and Aug.	6-8
<i>Achillea ptarmica</i> (the pearl or sneezewort)...	18-24	white	2	12	1-16	July	all summer
<i>Aconitum napellus</i> (aconite or monkshood)...	48	dark blue	4	18-24	1-4	July and Aug.	4-6
<i>Althaea rosea</i> (hollyhock).....	48-54	white, rose, yellow, purple	4	18-24	1-2	August	
<i>Anemone japonica</i> (Japanese anemone).....	24	white, pink	3	18	1-4	August	6-8
<i>Anthemis tinctoria</i> (golden marguerite).....	18-24	yellow	2	12	1-16	July	4-6
<i>Aquilegia</i> spp. (columbine).....	18-34	white, yellow, blue	3	9-12	1-16	May and June	8-10
<i>Arabis alpina</i> (rockcress).....	6	white	3	6	1-4	May to Sept.	4-8
<i>Asclepias incarnata</i> (swamp milkweed).....	36	rose	4	18	1-4	July	4
<i>Asperula odorata</i> (woodruff).....	12	white	2	8	1-16	June	8-10
<i>Aster alpinus</i> (hardy aster).....	18-36	blue	3	18	1-4	September	8-10
<i>Bellis perennis</i> (daisy).....	6-8	white, rose, streaked	3	8-10	1-4	Easter	8-10
<i>Bocconia cordata</i> (plume poppy).....	36	white	2	24	1-4	July	4-8
<i>Campanula</i> spp. (bellflower or harebell).....	6-36	blue, white	3	15-18	1-4	May	8-12
<i>Centaurea</i> spp. (cornflower or sweet sultan)...	18-24	yellow, white, purple	4	6-12	1-4	May	4-8
<i>Coreopsis grandiflora</i> (perennial tickseed)...	24-36	yellow	3	12	1-4	June	8-12
<i>Delphinium</i> spp. (larkspur).....	18-36	blue, scarlet	4	18-24	1-2	June and July	12-16
<i>Dianthus barbatus</i> (sweet-william).....	12-18	blue, pink	3	12-18	1-4	June	6-8
<i>Dictamnus fraxinella</i> (gas plant).....	24	red, white	3	18	1-4	June	4-6
<i>Digitalis purpurea</i> (foxglove).....	24-36	purple, rose, white	4	15-18	1-4	June	4-6
<i>Eryngium giganteum</i> (sea holly).....	24	blue	3	18	1-2	June	6-8
<i>Eschscholtzia californica</i> (California poppy)	8	white, pink, brilliant orange	2	8-12	1-16	June	all summer
<i>Gaillardia aristata</i> (blanket-flower).....	18-24	yellow	3	15-18	1-4	June	8-10
<i>Gypsophila paniculata</i> (baby's breath).....	18-24	white	3	15	1-4	July	8-10
<i>Heuchera sanguinea</i> (alum root; coral bell)...	15-24	crimson, rose	3	15	1-4	June	6-8
<i>Iberis sempervirens</i> (candytuft).....	9-12	white	2-3	9-12	1-4	May	8-10
<i>Lobelia cardinalis</i> (cardinal flower).....	48	carmine	3	15-18	1-4	July	4
<i>Lupinus polyphyllus</i> (lupine).....	48	blue, delicate white	4	24-30	1-2	June	6-8

FAVORITE BIENNIALS AND PERENNIALS—Continued

Name of Flower	Height, in Inches	Color of Flower	Distance Apart, in Inches		Depth to Sow (in.)	Month of First Flowering	Weeks in Bloom
			Pricking Out	Permanent Planting			
<i>Lychnis chalcedonica</i> (Jerusalem cross)	36-48	scarlet	3	12	1-4	June	4-6
<i>Lychnis coronaria</i> (mullein pink; rose cam- pion)	24	rose	3	12-18	1-4	June	4-6
<i>Myosotis</i> spp. (forget-me-not)	10-12	blue, white	3	10-12	1-4	April	all summer
<i>Oenothera biennis</i> (evening primrose)	36-42	yellow	2	18	1-8	July	6-8
<i>Papaver nudicaule</i> (Iceland poppy)	9-24	yellow, pink, scarlet	2-4	6-12	1-16	April, May	4-8
<i>Papaver orientale</i> (oriental poppy)	9-24	bright crimson	2-4	8-12	1-16	May	4-8
<i>Papaver rhoeas</i> (Shirley poppy)	24-36	red	2-4	12	1-16	May	4-8
<i>Pentstemon barbatus</i> (beard tongue)	36-42	pink to red	2	15	1-16	July	4-6
<i>Petunia</i> spp.	12-24	white, purple, rose, pink	2	8-12	1-4	June, July	all summer
<i>Phlox drummondii</i> (phlox)	6-12	white, yellow, pink, lilac, purple, crimson	2	8-12	1-8	May	4-6
<i>Platycodon grandiflorum</i> (balloon-flower) . . .	18	blue, white	3	15	1-4	June	4-6
<i>Primula polyanthus</i> (gold-laced polyanthus) .	8-10	creamy white to maroon	2	6-8	1-16	May	8-10
<i>Primula vulgaris</i> (primrose)	6-8	yellow	2	6-8	1-16	April	6
<i>Pyrethrum</i> spp. (painted daisy)	18	white, pink	3	12	1-4	June	6-8
<i>Stokesia cyanea</i> (Stokes aster)	15	blue	5	15	1-4	May	24
<i>Viola tricolor</i> (pansy)	8-10	blue, yellow, white, mottled	4	10-12	1-4	March in frames	8-10

roots of the plants. If a pool is used in combination with a rock garden, it should be informal. The concrete work should be carefully concealed with grasses and plants. The margins of the pool should be irregular and just as natural in appearance as possible. Iris, marsh marigolds, rockcress, dwarf speedwell, pyrethrum, columbine, and other plants adapted to a moist soil may be planted along the margins, and in the pool itself, water-lilies and other water plants.

Trellises, arbors, and pergolas lend interest to the garden, but these should always be draped with some kind of vine, climbing rose, or other trailing plant.

Weeds and Insect Pests

Once the garden is planted, weeds, various insect pests, and fungus diseases demand attention. Stirring the surface soil with a hoe throughout the growing season will keep down the weeds—those robber plants that steal the food and water from flowers and vegetables. The soil should be cultivated only to the depth necessary to destroy the weeds, as deeper cultivation is likely to injure the roots of the plants.

Our battle with insect pests and fungus diseases should begin before these enemies swoop down on the garden. Fungus diseases, such as mildews and rusts,

are controlled by sprays containing salts of copper, of which Bordeaux mixture is the best known. On the basis of their feeding habits, insect pests are classed as chewing, sucking, or boring insects. The chewing kinds, caterpillars, beetles, and other insects that eat the foliage, must be killed by a stomach poison, arsenate of lead or paris green, for example. The sucking insects (plant lice or aphids, leafhoppers, and the like), which pump the juices out of the plant tissues, must be smothered by oils or dusts or killed with paralyzing contact poisons, such as nicotine. The borers tunnel through the branches and roots of trees, shrubs, and other plants, and must be hooked out with a wire. Burning the refuse and stubble in the field will help rout the corn borer. (*See Spraying.*) We should remember that not all insects are pests. Bees, butterflies, moths, and many others play their useful part in the pollination of flowers. Others assist in the war against harmful insect pests by preying on these varieties. (*See Insect Pests.*)

Watering and Protecting the Garden

In order to thrive the garden needs frequent watering throughout the growing season. Usually a thorough watering once a week, moistening the soil to a depth

of at least four inches, is sufficient. Merely sprinkling the surface of the garden soil is worse than not watering the garden at all, for it causes the plant roots to reach for the water and come to the surface.

Winter protection of the trees, shrubs, and perennial plants of the garden must not be neglected. A mulch of hay or straw over the perennial plants after the ground has been frozen will protect them. Partly rotted manure, burlap, hay, straw or even ashes may be spread around trees and shrubs. The main purposes of a winter mulch are to prevent damage to the plant roots from alternate freezing and thawing, and to reduce evaporation of the moisture from the soil.

Some Practical Selections

Among the multitudes of flowers grown in gardens a few only have withstood the test of time. The unskilled gardener should not experiment with untried novelties. Annuals are most easily grown, but should be chosen definitely to fit the purpose. Most perennial flowers will thrive on moist soils, and should be selected carefully for the place they are to occupy as they improve year by year until crowded, when they must be taken up, divided into smaller pieces and replanted as at first.

Ten annuals useful as cut flowers: Sweet alyssum, China aster, baby's breath, coreopsis, Swan River daisy, nasturtium, pansy, sweet pea, Chinese pink, ten-weeks stock.

Six fragrant-flowered annuals: Bartonia, mignonette, sweet pea, ten-weeks stock, sweet sultan, sweet alyssum.

Six climbing annuals: Balloon vine, hyacinth bean, cypress vine, Japanese hop, moon-flower, morning glory.

Six annuals for sunny places: Love-lies-bleeding, balsam, hyacinth bean, gaillardia, nasturtium, rose moss.

Six annuals for shady places: Godetia, musk, nemophila, pansy, tarweed, wishbone flower.

Six annuals for rocky places: Annual phlox, candytuft, catchfly, clarkia, nasturtium (dwarf), rose moss.

Six annuals for sandy soils: Clarkia, poppy, godetia, nasturtium (dwarf and tall), rose moss, zinnia.

Six annuals for heavy soils: Annual chrysanthemum, godetia, sweet pea, petunia, sweet alyssum, pot marigold.

Six annuals that bloom after frost: Sweet alyssum, candytuft, cornflower, marigold, annual phlox, ten-weeks stock.

Tall perennials: Hollyhock, plume poppy, golden glow, double perennial sunflower, sneezeweed, late sunflower, Maximilian's sunflower.

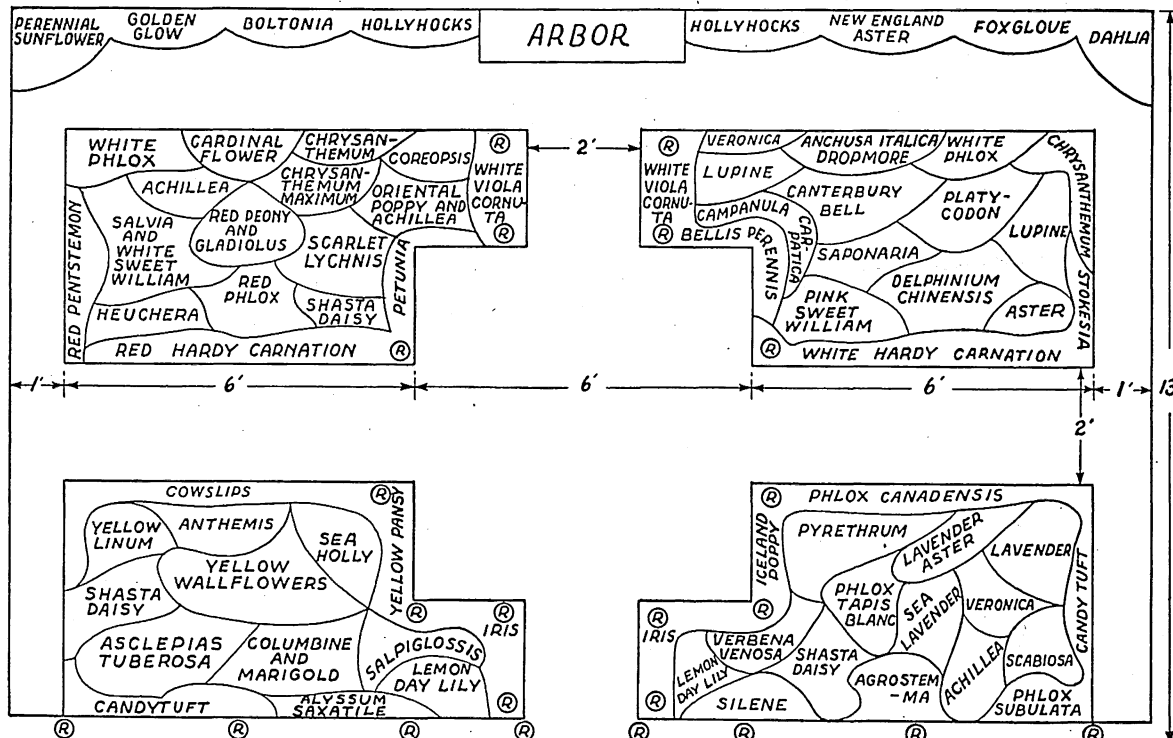
Medium height perennials: Common columbine, bleeding heart, European peony, sweet-william, Chinese peony, foxglove, oriental larkspur, peach-leaved bellflower, oriental poppy, perennial gaillardia, Japanese iris, balloon-flower, beebalm, swamp rose mallow, late perennial phlox, Japanese anemone, subsessile veronica, hardy chrysanthemums.

Low-growing perennials: Japanese adonis, crested dwarf iris, dwarf flag, golden tuft, moss pink, English daisy, white rockcress, Geneva bugle, tufted pansies or violas, snow-in-summit, woolly yarrow, Canada anemone, Carpathian harebell, coral bells, purple poppy mallow, hardy leadwort, smoothish fleabane, Napoleon III pink.

Perennials with fragrant flowers: Winter heliotrope, California and Russian violets, white rockcress, woodruff, lily-of-the-valley, peonies, gas plant, valerian, lemon lily, dwarf orange day lily, Scotch grass pink, fringed pink, sweet rocket, beebalm, entire-leaved bush clematis, August lemon lily, white day lily.

Perennials for cut flowers: Christmas rose, California and Russian violets, foxglove, oriental larkspur, everblooming ragged robin, pearl achillea, Japanese iris, Miss Lingard phlox, Japanese anemone.

PLANTING AN OLD-FASHIONED GARDEN



This is the plan for a colorful summer garden on a plot 13 by 20 feet. If bulbs, such as tulips, are wanted for early spring flowering, they must be put into the ground the previous fall. Roses are to be planted at points marked "R."

WHAT AND WHEN TO PLANT IN THE VEGETABLE GARDEN *

The dates of planting shown in this table are approximate for the United States and will vary with the season. The dividing line between North and South is considered to be the continuation of the southern boundary of Pennsylvania or about the 40th parallel of latitude. Unless you have a large plot do not attempt to grow all the vegetables in this table. Usually the small home gardener will find it more advisable to buy plants of such vegetables as asparagus (preferably 1-year-old roots), cabbage, cauliflower, celery, eggplant, pepper, tomato, etc., than to grow them himself.

Kind of Vegetable	Seeds or Plants Required for 100 Feet of Row	Time of Planting out of Doors (N = North; S = South)	Distance between Plants	Depth of Planting	Time Required to Secure Crop after Planting
Asparagus.....	60 to 80 plants	Early spring	2 ft.	5 to 6 in.	1 to 3 yr.
Beans, bush (kidney and lima).	1 qt.	N— April to July S— Feb. to Apr. (Aug.)	2 to 4 in.	1 to 2 in.	40 to 65 da.
Beans, pole (kidney and lima) ..	4 oz.	May and June	18 to 24 in.	1 to 2 in.	50 to 80 da.
Beets.....	1 oz.	Early spring	4 to 6 in.	$\frac{1}{2}$ in.	60 to 75 da.
Brussels sprouts.....	$\frac{1}{2}$ oz.	N— May to June S— Jan. to July	1 $\frac{1}{2}$ to 2 $\frac{1}{2}$ ft.	$\frac{1}{2}$ in.	100 to 125 da.
Cabbage, early.....	$\frac{1}{2}$ oz.	N—Mar.-April (start in hotbed Feb.) S— Oct. to Dec.	14 to 18 in.	$\frac{1}{2}$ in.	110 da. from plants
Cabbage, late.....	$\frac{1}{2}$ oz.	N— May and June S— June and July	18 to 24 in.	$\frac{1}{2}$ in.	150 da. from plants
Carrots.....	1 oz.	Early spring, May 15 to June 15	3 to 6 in.	$\frac{1}{2}$ to $\frac{1}{2}$ in.	80 to 110 da.
Cauliflower.....	$\frac{1}{2}$ oz.	May 15-June 15 (hotbed in March) May for early crop (start under glass in Mar. or April) July for late crop (sow seed in May)	1 $\frac{1}{2}$ ft.	$\frac{1}{2}$ in.	100 to 130 da. 160 to 170 da. from seed 90 to 100 da. from plants
Celery.....	$\frac{1}{2}$ oz.	Early spring to June 15	4 to 8 in.	$\frac{1}{2}$ in.	To middle of summer
Chard (Swiss).....	2 oz.	Early spring to June 15	4 to 6 in.	$\frac{1}{2}$ in.	60 to 100 da.
Corn, sweet.....	2 to 3 oz.	Early spring	12 to 18 in.	$\frac{1}{2}$ to 1 in.	60 to 80 da.
Cucumber.....	$\frac{1}{2}$ oz.	N— May to June S— Mar. to April	4 to 5 ft.	$\frac{1}{2}$ to 2 in.	60 to 80 da.
Eggplant.....	$\frac{1}{2}$ oz.	N— June S— Jan. to May	2 to 3 ft.	$\frac{1}{2}$ to 1 in.	120 to 150 da.
Kohlrabi.....	$\frac{1}{2}$ oz.	N— April to June S— Sept. to Mar.	6 to 8 in.	$\frac{1}{2}$ in.	75 to 120 da.
Lettuce.....	$\frac{1}{2}$ to 1 oz.	N— April to Aug. S— Oct. to Mar.	12 in.	$\frac{1}{2}$ to $\frac{1}{2}$ in.	60 to 90 da.
Melon, muskmelon.....	$\frac{1}{2}$ oz.	N— May 15 to June 15 (sow seed under glass April 15) S— Feb.	4 ft.	1 to 2 in.	110 to 130 da.
Melon, watermelon.....	1 oz.	N— May 15 to June 15 S— Mar. to May	7 to 10 ft.	$\frac{1}{2}$ to 1 in.	115 da.
Okra, or gumbo.....	1 $\frac{1}{2}$ to 2 oz.	N— May to June S— Feb. to April	14 to 36 in.	1 to 2 in.	115 da.
Onion, seed.....	$\frac{1}{2}$ oz.	N— April and May S— Oct. to Mar.	2 to 4 in.	$\frac{1}{2}$ in.	135 da.
Onion, sets.....	1 to 1 $\frac{1}{2}$ qt.	N— Early spring S— Fall and Feb.	2 to 4 in.	$\frac{1}{2}$ in.	60 da.
Parsley.....	$\frac{1}{2}$ oz.	N— Last of Mar. to 1st of April S— Sept. to May	3 to 6 in.	$\frac{1}{2}$ in.	95 to 120 da.
Parsnips.....	$\frac{1}{2}$ oz.	April and May	3 to 4 in.	$\frac{1}{2}$ in.	125 to 160 da.
Peas.....	1 qt.	N— Early spring S— Dec. to April	10 to 15 in.	1 to 2 in.	60 to 80 da.
Pepper.....	$\frac{1}{2}$ oz.	N— May and June (start early plants under glass in Mar.) S— Last of Mar.	18 to 24 in.	$\frac{1}{2}$ to 1 in.	100 to 140 da.
Potato, sweet.....	3 lb. (or 75 slips)	May and June (start in hotbed in April)	14 to 18 in.	3 in.	140 to 160 da.
Potato, white.....	5 to 8 lb. tubers	N— Mar. to June S— Jan. to April	12 to 18 in.	4 in.	80 to 140 da.
Pumpkin.....	1 oz.	N— May to June S— April and May	2 plants in hill 8 to 10 ft.	1 to 2 in.	110 to 140 da.
Radish.....	1 oz.	N— Mar. to Aug. S— Sept. to April	1 to 2 in.	$\frac{1}{2}$ in.	30 to 40 da.
Rhubarb.....	25 to 50 roots	N— Early spring S— Fall	2 to 4 ft.	2 to 3 in.	1 to 3 yr.
Rutabaga.....	$\frac{1}{2}$ to 1 oz.	N— June to July S— Aug. to Sept.	8 in.	$\frac{1}{2}$ to $\frac{1}{2}$ in.	70 to 100 da.
Salsify.....	1 oz.	Early spring	3 in.	$\frac{1}{2}$ to 1 in.	130 to 160 da.
Spinach.....	1 oz.	N— April 1 to Sept. 15 S— Aug. to Oct.	6 to 8 in.	$\frac{1}{2}$ in.	50 to 60 da.
Squash, bush or early.....	1 oz.	N— May S— Feb. to Mar.	3 $\frac{1}{2}$ to 4 ft.	1 in.	60 to 75 da.
Squash, late.....	1 oz.	N— May S— Feb. to Mar.	6 to 10 ft.	1 in.	125 to 150 da.
Tomato.....	$\frac{1}{2}$ oz.	N— May to June S— Jan.	2 $\frac{1}{2}$ to 4 ft.	$\frac{1}{2}$ in.	130 to 150 da.
Turnip.....	$\frac{1}{2}$ to 1 oz.	Early spring	2 $\frac{1}{2}$ to 8 in.	$\frac{1}{2}$ to $\frac{1}{2}$ in.	40 to 60 da.

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AMERICA'S SECOND MARTYRED PRESIDENT

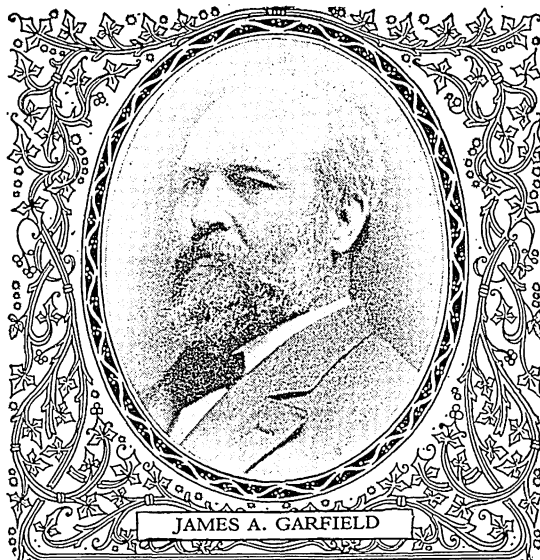
GARFIELD, JAMES ABRAHAM (1831-1881). When Garfield was assassinated on July 2, 1881, many comparisons were made between his life and that of Abraham Lincoln, the first "martyred president." Both were "self-made men." Both were born in log cabins, and endured in youth the privations which accompany farm life on the frontier—Lincoln in Illinois, Garfield in Ohio. As a young man, Lincoln took a flatboat down the Mississippi River; Garfield at about the same age served on a canal-boat on the Ohio and Pennsylvania Canal. Both were

eager for an education; but while Lincoln attained his knowledge by studying at night alone, Garfield was able by hard work to obtain a college education.

Though Garfield was a tireless reader from his earliest days, reading over and over again every book he could borrow, his youthful ambitions were not along the lines in which he made his name famous. One of the books he read and reread, beside the flickering flame of the wood fire in the log cabin, was a book of sea stories. These so caught his youthful fancy that he resolved to become a sailor. At 17, with his mother's consent, he tramped across the country to Cleveland, and tried to ship on a lake-boat. The captain drove him from the deck, and the disappointed lad had to content himself as stated with a job on a canal-boat, driving the mules along the towpath and acting as deck hand. A lucky attack of sickness sent him home, and his ambitions were turned to higher fields. By the time he recovered, his mind had been set on becoming a teacher, and he started off to school with a slender capital borrowed from his widowed mother. After his first term he needed no more help from her, for he worked his way through the Eclectic Institute at Hiram, Ohio (now known as Hiram College), by farm labor and carpentering. When he was ready to enter college his choice fell on Williams College, because its president was the celebrated Mark Hopkins, for whom Garfield had the greatest admiration. Garfield used to say, "A log with a student at one end and Mark Hopkins at the other is my ideal college." He was graduated from Williams in 1856.

Garfield as a College President

When Garfield became, at the age of 26, president of the Ohio College where he had taken his preliminary work, he proved himself a teacher of the same type as



Mark Hopkins—a man of unbounded zest for truth, limitless curiosity, and intense interest in his pupils. Had he remained in this work, he would doubtless have become one of the country's great educators. It is interesting to know that two of his sons also went to Williams College, and one of them, Harry A. Garfield, became its president. This son served during the World War of 1914-1918 in the important post of fuel controller. The second son, James R. Garfield, was secretary of the interior under President Roosevelt.

Garfield's rise was rapid. Within six years after his graduation he had been president of Hiram College, Ohio state senator, major-general in the United States army, and representative-elect to the United States Congress. A more rapid rise than this has been made by no American statesman, and the variety of the positions shows that he himself practiced his advice to young men, to "be fit for more than the one thing you are now doing."

Service in War and Public Life

While teaching at Hiram College, Garfield studied law; and from the time of his admittance to the bar, in 1859, until his death, he was continually engaged in politics, with the exception of the two years that he served in the field in the Civil War.

Though he was a brave soldier, and in 1863 was commissioned major-general for his bravery at the battle of Chickamauga, President Lincoln thought Garfield would be of greater use to his country in Congress. So he resigned his commission, in December 1863, and took the seat in the House of Representatives to which he had been elected the year before. There he made himself especially useful in the committees on military affairs and on finance. He served for 17 years in the House—until his election in 1880 to the Senate from Ohio; and it has been said that his speeches in Congress give a connected history of the times. Garfield was an impressive orator, because he had a powerful voice, great personal magnetism, and a straightforward style of address which aroused enthusiasm and carried conviction.

The triumph of his political career came when he unexpectedly received the Republican nomination for the presidency in 1880. The party was divided that year into two factions—the "stalwarts," who wished Grant to be nominated for a third term, and the

"half-breeds," who opposed Grant and for the most part favored James G. Blaine. Neither side would yield, and after a long fight they compromised on James A. Garfield, a "dark horse." Because Garfield was a "half-breed," Chester A. Arthur, an uncompromising "stalwart," was made the candidate for the vice-presidency.

His Personal Appeal to the People

In the campaign which followed, Garfield spoke in his own behalf, the first time that a presidential candidate had thus appeared before the people. He won an impressive victory, with a total of 214 electoral votes to 155 given to General Hancock, the Democratic candidate.

Garfield never had a chance to show his ability as chief executive of the country. Four months after his inauguration he was shot by Charles Guiteau, a disappointed office-seeker. The tragedy was the result of the bitter quarrel between the "stalwarts" and "half-breeds" over appointments to office, a quarrel which absorbed all of the president's time before he was shot.

The day of the tragedy was to have been a red-letter day in the president's life. He was on his way back to his beloved college, Williams, from which he had been graduated 25 years before, to join in the reunion of his classmates. The assassin's bullet struck him down as he was walking through the railway station in Washington to his train. Garfield lingered between life and death for weeks and finally died Sept. 19, 1881. He was the 20th president of the United States, the second who was assassinated, and the fourth to die while in office.

GARIBALDI, GIUSEPPE (1807-1882). "The third time's the charm," according to the old saying, but it was the fourth attempt which brought Giuseppe Garibaldi, the knight errant of Italian unity, his signal success and enduring fame. Twice he joined in vain attempts to free Italy from Austrian rule, first in 1834 and again in 1848—and both times he was forced to flee from the country. In 1834 he escaped to South America with a sentence of death hanging over him. There he stayed for 14 years, taking part in the civil wars of Brazil and Uruguay, earning for himself the title of "Hero of Montevideo," and forming the "Italian Legion" which was later to help emancipate the homeland.

Returning to Italy he took part in the unsuccessful Revolution of 1848, and commanded the forces of the short-lived Roman Republic which he and Mazzini set up. When this collapsed, Garibaldi escaped in a wonderful retreat through central Italy, pursued by the troops of four countries. This time he sought refuge in New York, where he engaged for several years in trade and commerce and succeeded in accumulating a small fortune.

His third opportunity came in 1859, when Sardinia-Piedmont, with French aid, went to war with Austria. Garibaldi's Alpine infantry was victorious in the north, but further advance was checked by the

peace made with the Austrians at Villafranca by the faint-hearted Napoleon III.

Secretly encouraged by Cavour, the great prime minister of Piedmont, Garibaldi and his "Thousand Red-Shirts" set forth in 1860 for Sicily, on one of the greatest filibustering expeditions in history and one that eventually gave to his king, Victor Emmanuel, the remaining half of Italy. Within a few short weeks after landing and assuming in the name of Victor Emmanuel the dictatorship of Sicily, Garibaldi had driven all the Neapolitan forces out of the island with little loss of life to his own men. He had come into possession of money, arms, boats, stores of all kinds, had increased his army to some 25,000 men, and had become the idol of all Sicily, to whom the red shirt of his warriors became the proudest badge of men and women. He had so completely aroused Italy that each town poured forth its young and old to join his victorious standard.

He Enters Naples in Triumph

When Garibaldi crossed from Sicily to the mainland, in August 1860, his march from Reggio to Naples resembled a triumphant procession. It was only necessary for Garibaldi to appear before a town for it to surrender. At one place, with a few hundred men back of him, he ordered 12,000 Neapolitan troops to surrender, and they immediately did so, for his cause was really their cause. He entered Naples in the midst of enthusiastic crowds, wildly cheering and singing the national anthem, from now on called the 'Garibaldi Hymn'. In accordance with the votes of the people, Garibaldi handed the kingdom of Sicily and Naples over to Victor Emmanuel, whom he acknowledged as the king of Italy.

Garibaldi himself, although he was the hero of Italy, was the most difficult problem that the new government of united Italy had to face. He never forgave Cavour for the cession of Nice—Garibaldi's birthplace—to France as the indispensable price of Napoleon III's aid to Italian unity. Only with difficulty was he restrained from his mad plan to attack Rome which was under the rule of the pope, although he knew that an attack on it would bring against the struggling kingdom of Italy the forces of both France and Austria—her friend and enemy. Twice the government was forced to send troops after Garibaldi and take him prisoner, in 1862 and 1867. When finally Italian troops entered Rome, in 1870, Garibaldi had no part in it, for he was at that time helping the new-born republic of France in its despairing struggle against Germany.

When the Franco-German war was over he retired again to his island home of Caprera, where he spent the rest of his life receiving admiring visitors and attempting to stir up the people to establish a republic in Italy. He was easily worked on by unscrupulous agitators who sought the overthrow of the united monarchy he had helped to establish. Fortunately the plots did not succeed, and Garibaldi today is regarded as the hero of Italian unity.

GARRISON IN THE OFFICE OF THE 'LIBERATOR'



This is the printing office of the *Liberator*, Garrison's little newspaper which provoked such a fury in the troubled days before the Civil War. In those times everything in a small printing plant was done by hand. Garrison, standing at the left, is setting type for the next issue. The man at the right is inking a form, and the man at the rear is working a hand press.

GARRISON, WILLIAM LLOYD (1805-1879). "I will be as harsh as truth and as stern as justice. I am in earnest—I will not equivocate—I will not excuse—I will not retreat a single inch—and I will be heard."

Imagine if you can the anger of the defenders of slavery, in January 1831, when the ardent young abolitionist, William Lloyd Garrison, hurled this challenge at them in the first issue of his paper, the *Liberator*, and further declared that he would not cease his agitation—

... till Afric's chains
Are burst and Freedom rules the rescued land.

And yet why should anyone fear this impetuous young reformer? He was poor, unschooled, and without influential friends; and he had recently been in jail for expressing his violent antislavery views.

Garrison was born in Newburyport, Mass., Dec. 10, 1805. His parents had come to the United States

from Nova Scotia earlier in the century. His father, a sea captain, deserted his family before the boy was three years old. So Garrison had early learned to battle the world.

He began his struggle as a breadwinner at the age of nine, when he set out to learn the trade of a shoemaker. Later he tried cabinetmaking, and finally he found his lifework in the printing office of the Newburyport *Herald*. Here he gained the education that he had no chance to acquire at school. He soon became an expert typesetter and began to write anonymously for the paper.

At the age of sixteen he wrote an article and sent it to the editor unsigned. We can imagine his joy the next morning when the editor gave it to him to set up in type, thinking that it was from one of the leading politicians of the state. With this encouragement Garrison went on until he too became a newspaper

editor. From the first he had been interested in the cause of the slaves, and he determined to devote his life to working for their freedom.

The anti-slavery cause was not a popular one in those days. Garrison could not get halls for his meetings; churches were closed to him; the state of Georgia offered a reward for his arrest and conviction; and his mail was filled with threats of death. In 1835 a mob dragged him through the streets of Puritan Boston with a rope about his body. But still Garrison kept on. Though the *Liberator* gained little financial support, Garrison and his partner were determined to keep the paper alive so long as they "could live on bread and water or find employment for their hands." By working 16 hours a day they managed to publish their little four-page paper nearly every week.

The Anti-Slavery Society

In 1832 Garrison organized the New England Anti-Slavery Society, the first of such societies in the United States; and the following year he went to England to consult anti-slavery leaders in that country, which was just on the point of passing a law freeing the slaves in its colonies. On his return he took a leading part in founding the American Anti-Slavery Society, of which he later became president. A brilliant band of orators and writers was gradually attracted to this organization, the most distinguished of whom was the eloquent Wendell Phillips. From Phillips the society gained not only the advantage of his magic tongue, but also a flavor of respectability as the result of his social standing.

The nickname of "abolitionists" soon came to be applied to all those anti-slavery advocates, from the views of the extremists, who demanded the immediate abolition of slavery without regard to the United States Constitution and without compensation. From the laws of man sanctioning slavery they appealed to the "higher law" of God and nature. Garrison even went so far as publicly to burn the United States Constitution and denounce it as a "covenant with hell and an agreement with death." No man did more to end slavery in the United States than did Garrison; but it is also true that no man did more to make peaceful compromise impossible and war inevitable, except the no less extreme and fanatical supporters of the cause of slavery in the South.

But the triumph of Garrison came at last in 1863 when the *Liberator* printed Lincoln's Emancipation Proclamation, and two years later when he chronicled the passage of the 13th amendment to the Constitution, forbidding slavery in the United States. Feeling that its work was done, Garrison then discontinued his paper. As Lowell wrote—

In a small chamber, friendless and unseen,
Toiled o'er his types one poor, unlearned young man;
The place was dark, unfurnished and mean,
Yet there the freedom of a race began.

Now that work was done and the freedom for the slave won. For a time Garrison's life seemed empty. But he was a born reformer and soon turned his

attention to other fields. During the last years of his life he gave his support to the causes of woman suffrage, temperance, and peace.

GARY, IND. Little more than a generation ago the site of Gary was a sandy waste, part of the great dunes region around the lower end of Lake Michigan. As if by magic a city was laid out which, within 25 years, came to have a population of more than 100,000. This made-to-order city was created in 1906 by the United States Steel Corporation and named for its chairman of the board, Elbert H. Gary.

The corporation sought a location for its mills close to the center of the growing Middle West market, where raw materials could be assembled and finished products shipped at minimum cost. The foot of Lake Michigan, 30 miles southeast of Chicago, met every requirement. Iron ore and limestone could be brought by freighter from the northern lake region; coal, by rail from the nearby fields to the south; and finished goods shipped by rail or water.

Dunes were leveled and the sand blanketed with a rich topsoil to support trees, green lawns, and gardens. Parks were laid out—the largest, Marquette Park, along the lake front. Civic buildings were erected. Besides the great steel mills, other early industrial establishments included a cement plant and a bridge works.

As Gary grew, other steel corporations built mills here; and manufacturers of automobile accessories, screws and bolts, electrical apparatus, hosiery and men's clothing established their plants in the town. Population (1940 census), 111,719.

The Gary School System

The "work-study-play" plan of the Gary school system has brought the city as much renown as its phenomenal industrial growth. The plan was established by Gary's first superintendent of schools, William A. Wirt.

The school authorities of Gary, appreciating their unique opportunity in creating a school system to order, deliberately undertook to build their system around approved principles of business efficiency. Like a factory; the schools must be made to produce the maximum for a given outlay. It is a patent fact, though most communities ignore it, that the average traditional school is idle two-thirds of the working time, and, consequently, the vast aggregate capital tied up in American schools yields less than one-third of the interest (use) that the stockholders (taxpayers) have a right to expect. Gary schools are open all day, six and one-half days a week, fifty-two weeks a year. They are open evenings for community purposes.

In the second place, a given building designed to seat, say, 900 pupils, is made to take care of 1,800 pupils. While half the pupils are in classrooms the other half are in shops, auditorium, and playground. This "platoon" arrangement has been worked out even more satisfactorily in other cities, such as Detroit.

Third, the Gary schools stress play as an integral part of the educational process. Play is just as important as the multiplication tables, or grammar, or spelling. Not a few educators say it is more important.

Then there must be a golden mean of freedom to give opportunity for the development of self-control, judgment, and social adaptability. The whole person must be exercised—head, hand, and heart. Hence, *all* children, from kindergarten through the high school, must have the opportunity of kitchens, laboratories, studios, gymnasium, and shops in which are taught such trades as carpentry, painting, printing, and many others. To carry this through, each building houses kindergarten and all twelve grades.

The Gary schools have received much praise and imitation; they have, of course, been subjected to criticism. A report of the General Education Board praises the following: the generous and modern conception of education on which the plan is based; the courage in undertaking it; the manner of organization; the democratic discipline; and the excellent spirit pervading the schools. It criticizes it in respect to administration and supervision of teaching and pupils' work and in lack of proper accountability, which results in letting slipshod work go unchallenged.

GAS. The most active state in which matter can exist is as a gas. Solids, left to themselves, will keep their shape undisturbed; liquids will alter their shape, but hold their volume constant; but gases have neither fixed shape nor size. Turn loose a thimbleful of air into a vacuum as big as a living-room, and it will expand and spread out until it fills the whole available space. The most familiar gases are those that form the air we live in (*see Air*). Eleven of the chemical elements (*see Chemistry*) remain in the gaseous state at ordinary temperatures. They are, in the order of their lightness, hydrogen, helium, neon, nitrogen, oxygen, fluorine, argon, chlorine, krypton, xenon, and niton (or radon). A great number of chemical compounds also are gases, familiar ones being ammonia, carbon dioxide, and the methane which forms a large part of the mixture in natural and coal gas. Besides these, gases are formed from a very large proportion of solids and liquids when their temperatures are raised. The commonest example is water turning into steam.

Different though gases may be from one another in chemical properties, they all conform to certain principles that are of prime importance to students of science. The molecules in a gas are much further apart

from one another and freer to move about than those in solids or liquids. According to the *kinetic theory*, at ordinary temperatures and at atmospheric pressure, these molecules travel across the open spaces that separate them at an average speed of about 1,500 feet a second. They collide, of course, and rebound from one another; but the total effect of the molecular activity is to press outward in all directions. Since heat increases molecular activity (*see Heat*), it necessarily increases the pressure exerted by a gas, which explains the power of hot expanding gases in the steam engine and the gas engine.

The relations between temperature, pressure, and volume of gases are described in the following laws:

Charles' Law: When the pressure is kept constant, the volume of a gas is directly proportional to its absolute temperature. (Also called Gay-Lussac's Law.)

Boyle's Law: When the temperature is kept constant, the volume of a gas is inversely proportional to the pressure upon it.

Avogadro's Law: Under equal conditions of temperature and pressure, equal volumes of gases contain the same number of molecules.

How Gases Are Liquefied

To turn a gas into a liquid, it must be compressed and cooled until its molecules are at once close enough

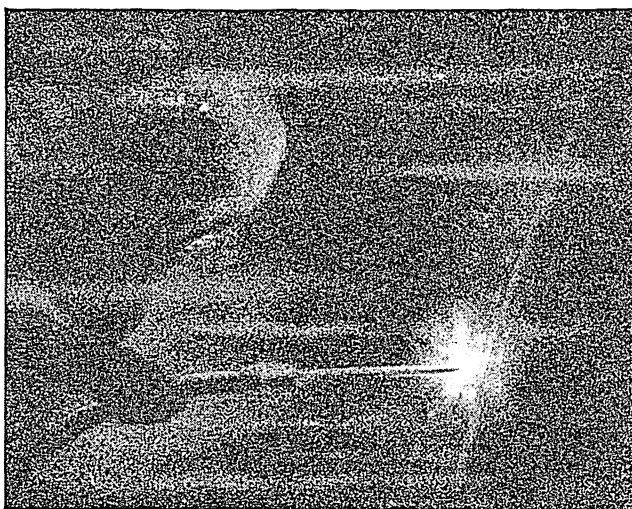
together and quiet enough so that cohesion can take place between them. The respective points at which this takes place for any particular gas are called its *critical pressure* and its *critical temperature*. Once liquefied, a sufficient lowering of the temperature of a gas will cause it to freeze or solidify.

When a solidified or liquefied gas vaporizes again, it expands enormously and absorbs heat from whatever is near it. This is the principle used in refrigeration (*see Carbon Dioxide; Liquid Air; Refrigeration*).

Gases are soluble in liquids in varying degrees—more soluble in cold than in hot liquids. Pressure increases solubility. Gases can be absorbed in large amounts by charcoal (*see Charcoal*), and by some metals, particularly finely divided platinum and palladium. This action is closely related to catalysis (*see Chemistry*).

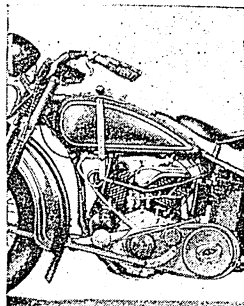
Compressed gases are now an important article of commerce. Immense quantities are shipped in steel cylinders under pressure. (*See also Acetylene; Ammonia; Chlorine; Gas, Manufactured; Gas, Natural; Helium; Hydrogen; Nitrogen; Oxygen.*)

GAS HELPS STEEL TO BURN UNDER WATER



The metal nozzle in the diver's hand and the steel plates of the sunken ship are both connected to an electric circuit, so that when they touch an arc is formed. At the same time a stream of oxygen flows from the tip of the nozzle, permitting the intense heat of the arc to burn up (oxidize) the steel. Thus the diver quickly cuts through the side of the vessel. The current used is of large amperage, but low voltage, so that little of it passes through the water.

HARNESSED EXPLOSIONS—The Story of GAS ENGINES



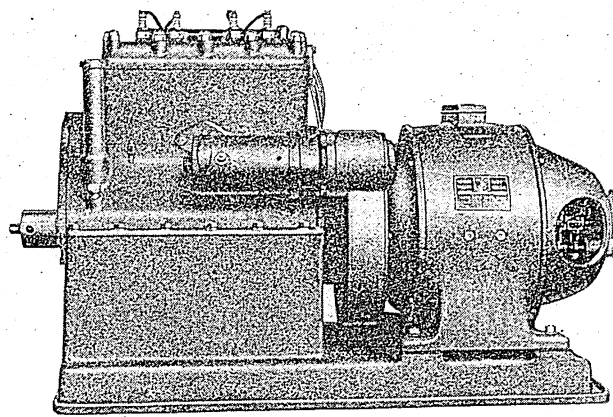
The powerful, compact, and light motorcycle engine.

GAS ENGINE. We cannot say that the automobile, the airplane, the dirigible balloon, and the submarine could not have existed at all without the gas engine. But it is certain that without it they would not have been developed so rapidly, so efficiently, and so economically. The steam engine requires a heavy boiler, a fire, and a large supply of fuel. The electric motor must get its electricity from a wire connected to a stationary plant or from a storage battery which is not only heavy but quickly exhausted. We may be sure that, with only steam and electricity, flying at least would not be a practical affair today.

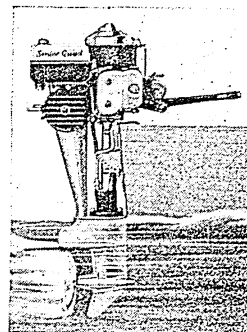
The gas engine is compact, light, and capable of very high speed. It is economical, simple in construction, and easy to operate. In many parts of the West you will come upon reservoirs, for irrigation or for watering cattle, which are fed by gas-engine pumps. A man visits them perhaps once a day to give them oil or gasoline, and the rest of the time they chug away in the wilderness until some worn part snaps under the long strain. And then almost any good blacksmith can mend them and set them to work again.

The uses to which the gas engine is put on the farm—where it has largely taken the place of the windmill—and in the shop are almost innumerable. In construction work it performs many of the tasks formerly assigned to the "donkey" steam engine, such as cement mixing, running elevators and derricks,

THE automobile hums over streets and highways; the swift motor boat sputters over lakes and rivers; the airplane roars its way through the clouds; the softly chugging submarine pierces the waves; and on the quiet farm sounds the whirr of machinery—pumping water, churning butter, lighting the house and barnyard at night with a blaze of electricity. All these are singing the great song of the gas engine—the engine that has transformed civilization and has made fairy tales and old wives' prophecies come true and given us so many of our modern miracles in less than half a century.



A small four-cylinder gasoline engine coupled to a lighting generator. Many hundreds of these plants are in use on farms, yachts, and the like.



The convenient outboard motor for small boats.

etc. In many places where natural gas or other motor fuel is cheap, big gas engines are used to generate electricity for public use. In all parts of the world—in the burning deserts, on far-away coral islands, in the arctic regions, in tropical forests—you will find the gas engine helping to do man's everyday work.

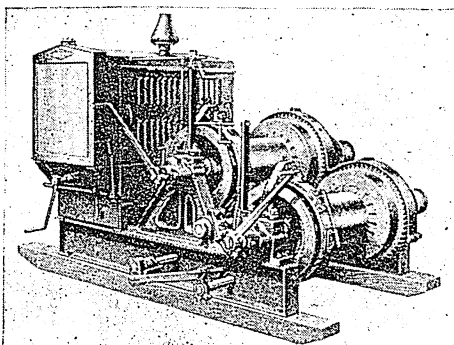
Gasoline is the fuel most commonly used today, but other substances can be employed if they yield a suitable explosive gas. Illuminating gas, blast-furnace gas, acetylene, propane, and butane are among the gases used; gasoline, kerosene, alcohol, and crude petroleum are among the liquid fuels. Many European automobiles employ charcoal, by heating it in an oven-like converter to produce an explosive gas. Of course, the engine must be specially designed to use each of these fuels.

Because gas engines depend for their power upon the pressure created by the gases burning within the motor itself, and not upon boilers or other external generators of pressure, they are called "internal combustion" engines. Their early development was so gradual and so interwoven with other inventions that no one man is given the credit for being the actual discoverer of this type of power machine.

Steps in Its Discovery

The first steps in this direction seem to have been taken late in the 17th century, when certain scientists experimented with "explosion" engines operated by gunpowder, without

FOR LIFTING BIG LOADS



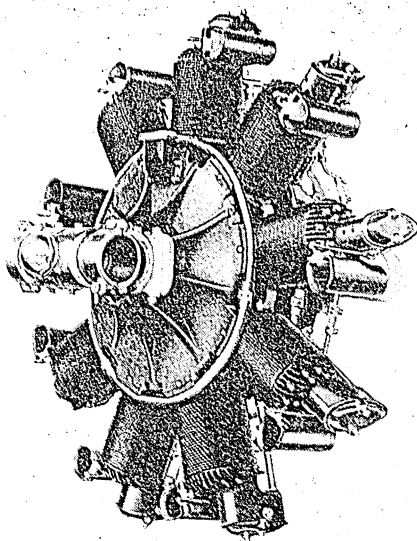
Wherever compact power is needed, we find the gasoline or the Diesel engine. This portable hoisting rig finds wide use among building contractors for running material elevators and other hoists.

practical results. In 1791 an Englishman named John Barber took out a patent on a turbine run by illuminating gas. In 1794 Robert Street used the explosions of turpentine vapor to drive a piston, and many others followed. But it was not until 1860 that Étienne Lenoir, a Frenchman, invented a gas engine which came into commercial use. The credit for devising the gas engine as we know it today rests, however, with Dr. Nicholas A. Otto of Cologne, Germany, who worked out in 1878 the "four-stroke cycle" system found in most modern motors.

In its simplest form the gas engine consists of a cylinder open at one end, a piston sliding back and forth in the cylinder and joined to a crank on the power shaft by a connecting rod. On the shaft is a heavy flywheel, whose momentum helps keep the shaft turning once it has started. The explosive mixture is taken into the cylinder by way of ports near the bottom of the cylinder; on the opposite side of the cylinder similar ports act as passages for the burned exhaust gases.

In such an engine—the "two-cycle" type—which is very popular in outboard boat engines, there is a power stroke for each revolution of the shaft, or up-and-down movement of the piston. As the piston reaches the bottom of its stroke, it uncovers the ports and the exhaust gases rush out, while at the same time the fresh gas mixture, which has been compressed in the air-tight crankcase, rushes in from the other side.

AN AIRPLANE DIESEL



This 200-horse-power engine uses cheap, safe fuel, and requires no electric ignition system, which still further reduces the danger of fire.

The upward stroke of the piston not only compresses the fresh mixture, but sucks a new supply into the crankcase. Then the explosion at the top of the stroke starts a new cycle. The explosion is caused by an electric spark at the proper instant.

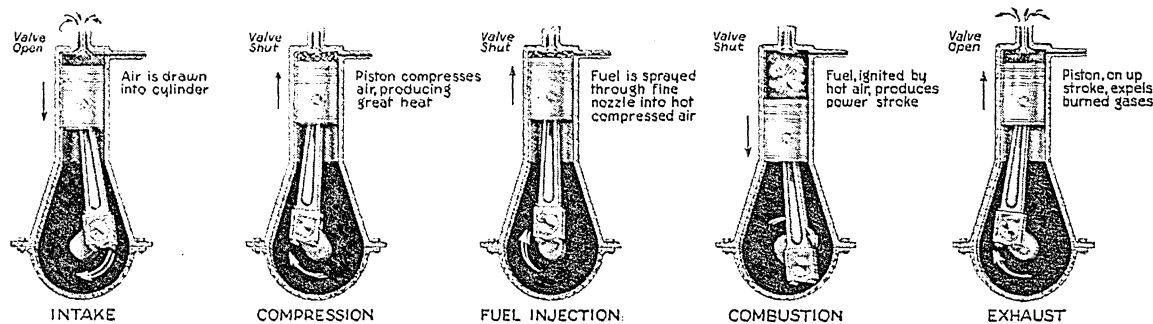
The Four-Cycle Engine

By far the greatest use of the Otto, or four-cycle, engine is in automobiles. Instead of having ports near the bottom of each cylinder, however, the mixture enters near the top through passages opened and closed by mechanically-operated valves, and the exhaust gases pass out through similar passages. All the other essentials of the simplest engine remain. For a description of the operation of the four-cycle

engine, as well as a diagram of its various parts, see the article on the Automobile.

The operation of the valves is controlled in such engines by cams driven from a shaft which turns at one-half the speed of the main shaft. This camshaft also controls the mechanism which times the electric spark to fire the charge. The most common method of securing the spark makes use of a spark plug, a device with a porcelain core enclosing a center wire, or electrode. The metal shell holding the core is fitted with another wire, which is separated from the center wire about one thirty-second of an inch; this "spark gap" is inside the cylinder. A wire from the spark coil leads to the center wire of the plug, the current thus being forced to jump the gap between the wires in

HOW THE DIESEL ENGINE OPERATES



Compare this simplified diagram of a four-cycle Diesel engine with that of the gasoline engine in the Automobile article. The first two strokes of the cycle are almost the same. The important difference is in the fuel intake and ignition. At the top of the second stroke the air in the cylinder is so highly compressed that its temperature rises to about 1,000° F. When the fuel is injected, it ignites

spontaneously, without the need of a spark. The rest of the cycle is similar to that of the gasoline engine. Fuel of low volatility can be used: molasses, crude oil, shale oil, fish oil, even powdered coal, have been successfully used in these engines, which require little supervision. Small Diesels are usually started by ordinary electric starters; big engines use compressed air. No "warming up" is needed.

order to return through the metal of the engine to the other side of the ignition source—battery or magneto.

How a Four-Cycle Engine Works

Here is what happens when a one-cylinder Otto engine is running with illuminating gas: The piston is drawn down, opening the intake valve and sucking the gas into the cylinder. This is the first stroke. As the piston starts upward on the second stroke, the intake valve is closed, and the gas that has been sucked in is compressed into the top of the cylinder. As the piston reaches the top of its stroke the electric spark is set off, exploding the gas and forcing the piston violently downward on the third stroke. As it comes up on the fourth stroke, the exhaust valve opens, and the piston forces out the burned gas. The next stroke sucks in fresh gas again, and the whole process is repeated over and over.

As may be seen, there is only one explosion to every four strokes of the piston or every two revolutions of the crankshaft. The force of this explosion is taken up by the flywheel whose impetus keeps the engine moving until the next explosion. In two-cylinder engines the cylinders are timed so that one of them explodes at each revolution, giving a more continuous flow of power. If there are four cylinders, one of them explodes at each half revolution, and so on for six, eight, and twelve cylinders. The cranks for the sepa-

rate cylinders are, of course, arranged on the shaft to conform with the time of the explosions.

The crankshaft, the camshafts, etc., are usually inclosed in a covering called the crankcase. The bottom of the crankcase is filled with oil, and as the piston rod splashes into this oil at every revolution, the interior of the engine is lubricated.

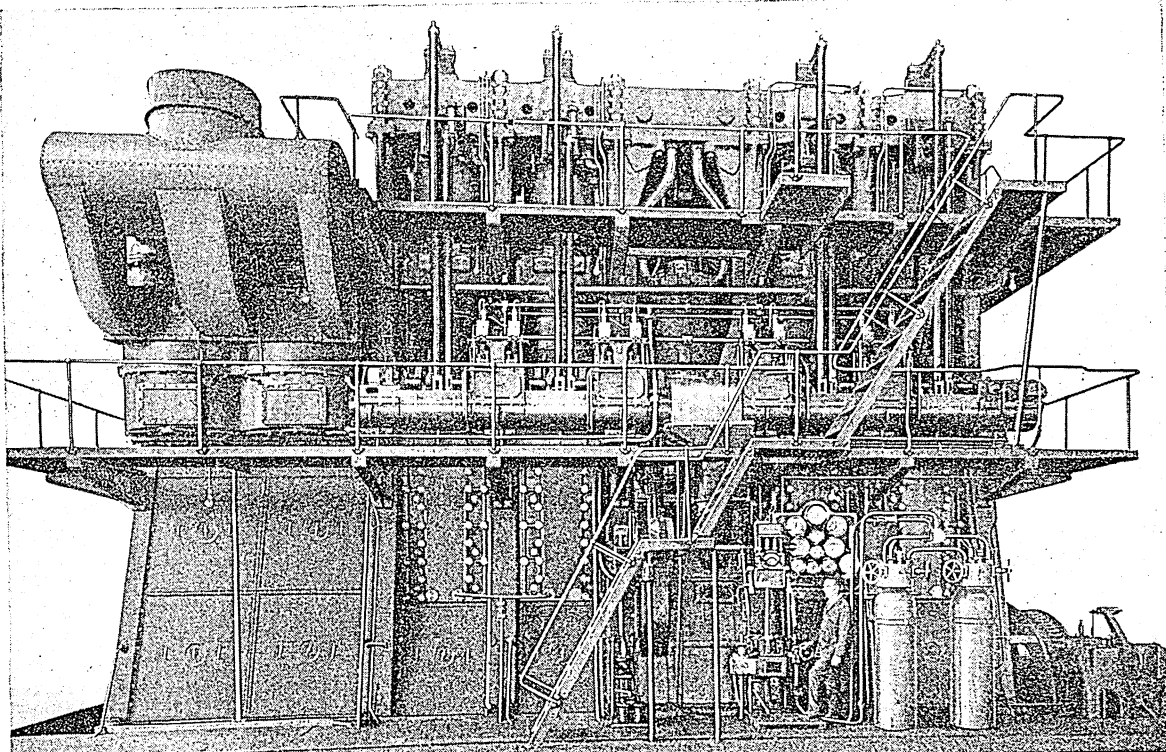
The Lungs of the Engine

So far, we have seen all the essential parts of an engine designed to run on ready-made gas. But when gasoline or any other liquid fuel is used, the Otto type of engine has to have an attachment for turning this liquid into a gas or vapor and mixing it with air so that it will explode. This attachment is known as the carburetor, and may be called the "lungs" of the gas engine. Acting under the suction of the piston, air is drawn at tremendous speed through a narrow passageway in the carburetor. In this passageway is a needle valve, which is kept filled with gasoline by a float device. As the air rushes past the valve, it draws out the fuel in a fine spray or vapor, which mixes with the air and is thus carried into the cylinder.

The Economical Diesel Engine

Diesel engines, invented in 1892 by Rudolf Diesel (1858-1913) of Germany, differ in one important operating feature from other internal combustion engines. The Diesel engine dispenses with both the

A POWERFUL, PATIENT, SEA-GOING GIANT



One of the largest marine Diesels built in the United States is the giant above, now installed in the United States Shipping Board freighter *Wilcox*, which it drives at 13 knots. This engine develops 3,680 horse-power continuously, and can turn out 4,000 horse-power for short periods. During its acceptance tests it ran continuously for 30 days with no adjustments—a world's record. The engine is a four-cylinder, two-cycle, double-acting type. Air for running comes from the pump at the extreme left; another separate pump supplies highly compressed air for starting.

carburetor and the electrical ignition system of the gasoline engine by using pressure for firing. Each piston sucks in air on the downstroke, then compresses it on the upstroke. The pressure, which may reach 600 pounds or more to the square inch, makes the air extremely hot. At this moment fuel is injected and the hot air sets it on fire. This principle is applied to both two-cycle and four-cycle engines.

Advantages and Disadvantages of Diesel Engines

Since engine efficiency increases with the amount of compression used, the Diesel engine obtains about one-third more power from the fuel than a gasoline engine would from the same amount. Diesels also burn the "fuel oil" fraction of petroleum instead of gasoline. This oil costs less, because of less demand and lighter taxes. Medium-sized and large engines have power enough to compress and burn extremely low grades of fuel oil.

One disadvantage of Diesel engines is high first cost. The engine must be heavier than gasoline engines of equal power because of the high pressure it has to withstand. Double-acting, two-cycle Diesel engines, in which explosions take place on both sides

of the pistons, obtain greater power from the same engine weight, and thus overcome this disadvantage to some extent.

Before 1920, motor ships with Diesel engines seemed about to drive steam from the seas because of low operating cost and because elimination of a steam boiler left more room for cargo. Since then, improved steam engines have held a place, especially in high-speed vessels. Low operating cost has brought wide use of Diesels in power-generating plants and on trucks. Railroads use Diesel-electric units in streamlined trains (*see* Railroads). Other common uses are for tractors and in construction machinery.

Higher first cost, greater weight, and some lack of flexibility have hampered adoption of Diesels in passenger automobiles and airplanes. Today, however, the weight of airplane types has been reduced to about two pounds for every horsepower. This is light enough when economy counts for more than speed. Another advantage is safety. Not even a lighted match can set fire to Diesel fuel. The absence of an electric ignition system also eliminates interference with radio reception on the airplane.

The INVISIBLE FUEL that COOKS Our Meals

*How William Murdock Took a Tea Kettle Full of Coal, a Thimble,
and a Little Iron Pipe, and Gave the World a New
Source of Light and Heat*

GAS, MANUFACTURED. A Scottish engineer named William Murdock about 1792 began the experiments which resulted in the application of coal gas to lighting purposes. He heated coal in a kettle and by means of an iron tube carried the resulting yellow gas to a tank. When he had collected enough gas he fitted over the end of the tube a silver thimble, in which he had bored a small hole. Lighting the gas that escaped through the hole in the thimble, he found he had a good light to read by. He had a gas storage tank, a gas pipe, and a gas jet—a complete gas plant on a small scale.

You can make gas just as William Murdock did. Fill a clay pipe with coal dust. Cover the top with modeling clay or stiff mud. Then set the bowl of the pipe over a flame to get very hot. In a few minutes a yellowish smoke will come through the stem. Touch a match to it, and it will burn, but not very clearly, for it is full of impurities. In gas plants these impurities are taken out to make a colorless, smokeless gas and a clear flame.

By 1802 Murdock had succeeded in producing gas in sufficiently large quantities for lighting a foundry, and five years later his discovery was applied to the lighting of streets in London. American scientists who heard of Murdock's achievement followed his example. Gas was used on a small scale for street lighting in Newport, R. I., in 1806, and in 1817 Baltimore installed a complete system of street lighting. Today coal gas is used to light or heat many

houses, to cook our meals, and to furnish fuel and power for industries.

In the manufacture of gas great ovens of brick, called retorts, are filled with from 250 to 350 pounds of coal; a large gas works may have a hundred furnaces or more, each heating from five to ten of these retorts. The retorts are tightly closed, and the coal is roasted, producing coke (*see* Coke) and gas. This coal gas is a mixture of various substances, chiefly hydrogen, carbon monoxide, marsh gas (methane), and other hydrocarbons which burn readily. Nitrogen and carbon dioxide, which are incombustible, are also present, and the gas contains many impurities, such as ammonia, tar, sulphur compounds, and water vapor. To rid it of these, the gas is passed through water, where it loses some of its tar and ammonia; it is then condensed, and passed through the "scrubber" to remove more tar and ammonia. Formerly the tar was not used, but today it is a valuable by-product (*see* Coal-Tar Products). Finally the gas passes through layers of lime or oxide of iron to remove the sulphur, after which it goes into huge storage tanks until it is used. These tanks are great iron cylinders, closed at the top and open at the bottom, resting in cisterns of water. They rise and fall according to the volume of the gas, thus keeping a constant pressure which forces the gas out through the mains.

The old-fashioned flat-tip burner was for many years the only method of using gas for lighting. Two discoveries revolutionized lighting methods and enabled

the production of a much better light with the use of less gas. One of these was the invention of the Bunsen burner, which mixes the gas with the air and thus produces complete combustion and much greater heat, with an almost colorless flame. The other was the invention of the incandescent mantle, in 1886, by Dr. Carl Auer von Welsbach of Vienna. In the Welsbach system the light comes from a "mantle" heated white-hot in the Bunsen burner. The materials for these mantles come from opposite sides of the earth. Natives of India grow the China grass, whose fiber is needed for weaving the mantles, while in far-away Brazil rare earths are mined containing the chemical elements thorium and cerium, with which the mantles are saturated. After the vegetable fiber of the China grass has been burned away, a mineral "skeleton" of the fabric is left, which glows with a bright white light. The illuminating power of gas is increased about three times by the use of the Welsbach mantle.

But, with the advent of electric lighting, the use of gas for illumination has become less important than its use as fuel. The gas range has largely replaced the coal range in the homes of city dwellers, its chief advantages being the ease with which the heat can be turned on and off, and its general cleanliness.

Gas is distributed from the manufacturing plant through "main" pipes, usually 6 to 30 inches in diameter. From these, smaller service pipes lead to the individual consumers, where meters measure the amount used (*see Meters*). The pressure in the service pipes varies in different places from about one to two ounces per square inch. In places where the population is scattered over wide areas, the use of high-pressure gas (from 10 to 20 pounds per square inch) has been largely advocated in recent years.

Many cities now use a gas called "water gas," a mixture containing chiefly hydrogen and carbon monoxide, made by passing steam through red-hot coke or hard coal. The gas thus produced burns with a very hot blue flame, but it is extremely poisonous because of the high percentage of carbon monoxide

it contains. To fit it for use as an illuminating gas it is "carbureted," that is, mixed with gases which burn with a luminous flame, such as ethylene and acetylene. Another gas, highly useful in industrial

processes, is "producer" gas. The best quality is made by passing air through white-hot coke, although coal and even peat may be used. Blast-furnace gas, generated in the operation of blast furnaces, is of this type.

Railroad cars in the United States were formerly lighted by compressed *Pintsch* gas, distilled from petroleum, but now electricity generated on the train is used. Acetylene gas is widely used where there are no central gas works (*see Acetylene*). Gasoline is also used for illumination, by vaporizing it in a current of air in an incandescent mantle.

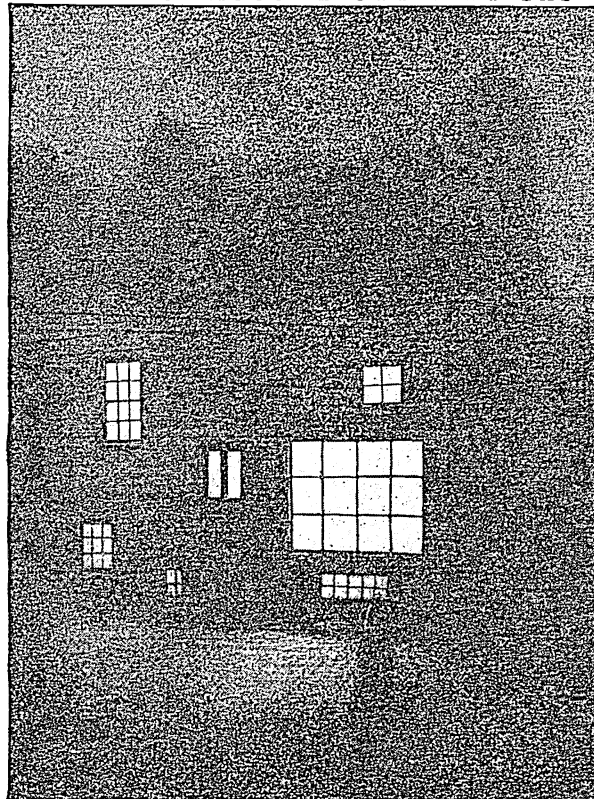
GAS, NATURAL. For a long time natural gas was regarded merely as a curiosity. In Persia and British India, where it issued from crevices in rocks, it was kept burning and was worshiped by the natives as a tribute to their fire-god. Near Baku, on the Caspian

Sea—one of the world's greatest oil centers—are the ruins of an old temple built on the site of one of these fiery jets.

The United States apparently has the greatest wealth of natural gas. "Burning springs" were known in this country as early as 1775, and the first discovery of gas by drilling was made early in the 19th century. Workmen boring a salt well in Ohio struck a subterranean gas pocket, and when the gas flamed forth they fled from the spot crying, "We have drilled through to hell!"

In 1821 natural gas was used for lighting in Fredonia, N. Y., but it was not until 1872 that it began to be collected and piped on a commercial scale. The beginning was made in Titusville, Pa., in the heart of the Pennsylvania oil regions, and since that time the natural gas industry has had a tremendous growth. The total amount used each year is now valued at over \$450,000,000, a sum several times as great as the usual annual gold production of the United States. Natural gas has almost twice the heating capacity of

THE FIRST HOUSE LIGHTED BY GAS



Imagine the astonishment of passers-by when they saw the windows of William Murdock's house in Redruth, England, gleaming for the first time with a brilliance that no candles or lamps could hope to attain! He made the gas at home and the next year (1802) illuminated a foundry with the new fuel.

manufactured gas, so it is used in many places to enrich the manufactured variety.

Natural gas is a mixture of combustible gases and vapors, chiefly methane. At some places it is found alone, at others it is mixed with oil, from which it must be extracted. At still others it occurs with oil, but is not mixed with it. Nearly all oil fields have gas, which is thought to be produced by the decay of organic matter—probably from both animal and vegetable remains deposited in bygone ages. Its natural reservoir is porous rock, such as a coarse-grained sandstone or limestone, with a covering of heavy shale which keeps the gas in and keeps out air.

In most gas fields the gas-bearing beds are arched up and the gas is accumulated in the arches, often above oil (*see* page P-144). Wells are sunk to depths of 250 to 9,000 feet or more, and are from two to eight inches or more in diameter. Natural gas is found mostly in the United States and in Poland, Rumania, Russia, Germany, France, India, China, Japan, and in other countries. Chief producing centers in the United States are Oklahoma, Kansas, Texas, California, Louisiana, Pennsylvania, Kentucky, and West Virginia.

Billions of dollars worth of natural gas has been wasted at oil fields, where great flaming wells have blazed unchecked for months. At one Oklahoma field, gas worth \$75,000 escaped every day for a year, while only \$25,000 worth of oil was collected daily. When the great Mary Sudik No. 1 well broke loose in Oklahoma, 100,000,000 cubic feet of gas was wasted daily for weeks before it was brought under control.

The problems of gas transportation are rapidly being solved so that the industry has come to rival that of coal, oil, and electricity for producing heat and power, but long-distance pipe lines are so expensive to install that natural gas fuel will probably always be more costly than coal at most places. It is very clean and convenient and nearly 5,000,000 American homes use natural gas for lighting, heating, or cooking.

Great pipe-line systems, similar to the oil pipe lines which form a network over the country, now carry natural gas from its source to far-distant communities. Lines from northern Louisiana serve New Orleans, Atlanta, Birmingham, and St. Louis. Lines from Texas run to Denver, Chicago, and Detroit, more than 1,000 miles from the source. West Virginia gas is carried to Pittsburgh and other eastern cities. Electric welding of the pipe joints, with expansion joints and elastic couplings, solved the problem of leaking pipes and made these systems possible. Nearly 200,000 miles of pipe lines have been built and important new projects are under way. Compression, or "booster," stations every 100 miles along a line reduce the volume but increase pressure.

The storage problem is solved in part by holding the gas in its natural reservoirs until it can be used, or by storing it in abandoned gas fields. One such abandoned field now in such use holds six times as much gas as all the steel gas holders in the country.

The higher grades of natural gas are compressed and stored in steel cylinders which are used in country houses, yachts, and other places that have no piped gas service. Thus isolated places may have this fuel and also ice, which can be made by burning gas in a suitable refrigerating machine (*see* Refrigeration).

Nearly 3,000,000,000 gallons of gasoline have been secured from natural gas in one year; the product is richer than gasoline distilled from petroleum.

Carbon black, a fluffy, velvety-black pigment (soot), is secured by burning a natural gas flame against an iron plate. Its chief use is in making automobile tires, about two pounds of carbon black increasing the life of a tire two or three times by toughening the rubber and increasing its tensile strength. This pigment is also the basis of printing ink, and is used in phonograph records, paints, typewriter ribbons, insulating materials, arc-light carbons, brushes for electrical machinery, and stove polish. Texas and Louisiana are the chief producing states, and supply over 90 per cent of the country's output, but carbon black is made also in West Virginia, Kentucky, Montana, and Wyoming.

GASOLINE. This colorless, inflammable fluid is produced by distilling crude petroleum or by "cracking" crude oils under pressure at high temperatures, or is extracted from natural gas. It was considered a waste product in the kerosene age. Now its great power in internal combustion engines has made it the usual fuel for automobiles, airplanes, tractors, etc. In England gasoline is called *petrol*, and in France *essence*. For the various grades, anti-knock gasolines, production methods, etc., *see* Petroleum.

GAS WARFARE. Poisonous and asphyxiating gases were used in the days of Byzantium and by the Saracens against the Crusaders of the 13th century. Greek fire, generating poison gas, was hurled into Charleston during the American Civil War, and the Confederate general Beauregard protested hotly. In 1907 a Hague convention forbade the use of poisons or poisoned arms, and the use of arms which would cause unnecessary suffering. The United States refused to sign the convention, but Germany and the other European powers did. When the Germans first used chlorine gas in 1915, they contended that the release of gas from cylinders did not come under the rules, because a cylinder was not a form of arms or a projectile. Although both sides thereafter used gas, first in cylinders and later in shells, until the end of the war, the Treaty of Versailles assumed that the use of poison gases was contrary to international law, and the Washington Conference on the Limitation of Armaments (1922) confirmed this stand. Chemists say gas is more humane than explosives, citing statistics that chemicals caused less than ten per cent of the casualties in World War I, and less than one per cent of fatalities; they say a gassed soldier recovers quicker than a man badly wounded by gunfire.

Familiar war gases are called casualty gases, lung irritants, vesicants (blisterers), lachrymators (tear

gases), and sternutators (sneeze gases). Mustard and Lewisite are blisterers; phosgene and chloropicrin are lung irritants; white phosphorus is a skin irritant. The weapons adapted to gas use are artillery shells, airplane bombs, portable cylinders, grenades, the Stokes mortar, and the Livens projector.

To protect both combatants and civilian populations against gas attacks, every nation has developed its own type of gas mask. Masks give protection by filtering out the poison vapor from the air to be breathed. The purifying agent usually is a mixture of soda lime impregnated with potassium permanganate, and nutshell charcoal. Special clothing is worn to give protection against gases that attack the skin.

GATES, HORATIO (1728-1806). After commanding America's victorious troops at Saratoga in one of the world's decisive battles, Gen. Horatio Gates retired from the army in disgrace before the Revolutionary War ended (*see* Revolution, American). As a young British officer, he had served under Braddock during that general's defeat by the French in 1755 and had settled in Virginia when that war ended in 1763.

GELATIN. When you eat the quivering, variously colored dessert so often served with cream in a jelly-like mound, you are making an intimate acquaintance with one of the many uses of gelatin—its use as a food-stuff, in puddings, jellies, soups, etc.

Gelatin is a hard, yellowish, semi-transparent substance extracted from the white connective tissues, bones, and skins of food animals. It is a protein food of high nutritive value, and it helps digest other foods. Vegetable gelatins are made from Irish moss and other seaweeds.

Chemically gelatin is the same as glue (*see* Glue), but is made more carefully and of better stock. The bones are treated with hydrochloric acid, then are boiled to remove mineral matter. Crude gelatin is cut into slices, dried, and sold as glue. Gelatin may be purified by dissolving it in hot water and adding alcohol. Purified with sulphurous acid and other chemicals, later removed, it makes the tough, whitish, semi-transparent "isinglass" used in refining liquors and stiffening food. Another kind of isinglass is obtained from the air-bladders of fish. Gelatin is one of the ingredients of printing-press rollers. It is used as a coating or capsule for pills, in dyeing and tanning, and in making paper, waterproofing material, India inks, artificial leather, and artificial silks. It forms the base in which are embedded the sensitive chemicals used to coat photographic plates, films, and papers. Since gelatin is a colloid (*see* Colloids), it tends to prevent the growth of crystals where it is present, and being an emulsifier, it helps hold in union two liquids that otherwise would separate. A solution containing more than one per cent gelatin becomes stiff when cooled.

GLITTERING PEBBLES *More Precious than GOLD*

GEMS AND JEWELRY.

Ornaments of gems and gold, of carved stone, shell, or ivory, of enamel, pearl, wood, bone, or iron, have delighted all ages of men since the first savage hung a necklace of teeth about his neck to ward off evil spirits.

Jewelry has been found at Ur of the Chaldees, and beautifully wrought rings, necklaces, brooches and other ornaments have been taken from royal Egyptian tombs. The Egyptians of those early centuries knew nearly every secret of the jeweler's art as practised today, and the modern goldsmith has yet to equal the granulation of gold surfaces achieved by Etruscan goldsmiths 700 years B.C.

The Greeks favored filigree and enamel, and at one time wore earrings so large they had to be hung from a bandeau. In the stern days of the Roman Republic only ambassadors were allowed to wear gold rings, and even as late as the first century A.D. a Roman girl's betrothal ring was of iron. But as Roman extravagance increased, we read of one Roman lady who covered her betrothal gown with pearls and emeralds, and Pliny tells us of another who was prepared to

produce at a moment's notice receipts proving that she was wearing jewelry worth \$1,500,000.

Bracelets were the insignia of kings in ancient Hebrew days, and Roman soldiers were awarded bracelets for bravery. The Bible contains many references to jewelry, including the famous breastplate of the High Priest with its 12 gems, sardius (ruby),

topaz, carbuncle, emerald, sapphire, diamond, ligure, agate, amethyst, beryl, onyx, and jasper.

Byzantine jewelry was rich, and of formal pattern. In the less skilful centuries, the Byzantines thrust into gold crowns, crosses, or book bindings the gayest of uncut gems and baroque pearls, much as raisins are pushed into cookie dough. Of this crude type of work are the eight massive crowns of Visigoth kings of the 7th century, unearthed at Guarrazar, Spain.

The Middle Ages delighted in jeweled reliquaries and other religious objects, in robes and gloves sewn thick with gems. The Renaissance further refined the jeweler's art, with designs by such great artists as Botticelli, Ghiberti, and Benvenuto Cellini in Italy, and Albrecht Dürer in Germany. Kings and popes

BIRTHDAY STONES

The following are the birthday stones and their supposed significance:

January	Garnet	Constancy
February	Amethyst	Sincerity
March	Bloodstone	Courage
April	Diamond	Innocence
May	Emerald	Success in love
June	Agate	Health and long life
July	Carnelian	Content
August	Sardonyx	Conjugal felicity
September	Chrysolite	Antidote to madness
October	Opal	Hope
November	Topaz	Fidelity
December	Turquoise	Prosperity

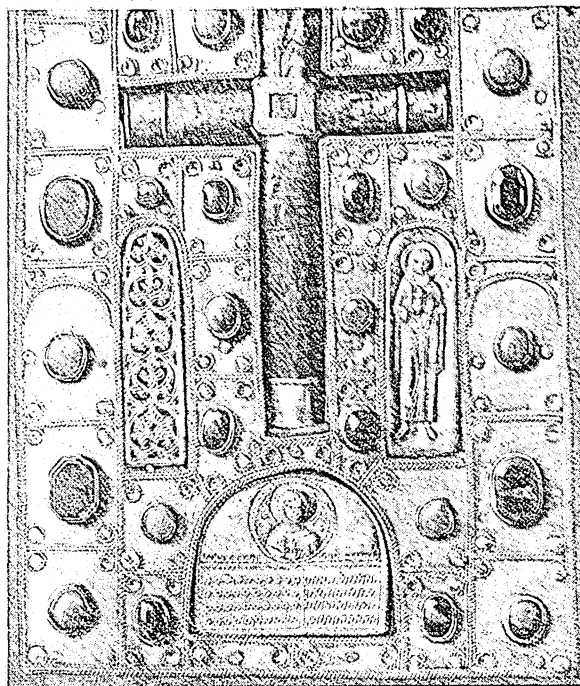
bid for Cellini's jewelry. Famous are Francis I's salt-cellar and Clement VII's "morse," or button.

As machinery has replaced handwork in the Western World, jewels are more skilfully faceted and more brightly polished than ever before. The result of the machine in simplifying all forms of design is seen in the straight lines, abstract form, and bold effects of modern jewelry. Platinum has replaced gold in fine diamond settings. Antique jewelry has had a considerable vogue in recent years.

Jewels of the Orient

Nowhere has jewelry been more beautifully made, more highly valued, or more widely worn than in the Orient. In the bazaars of India workmen today make the most exquisite ornaments, in designs which may be 2,000 years old. Men, women, and children in India wear jewelry to a degree which seems in bad taste to the occidental eye. They do so largely as a means of carrying their realized wealth, in a land where banks are neither numerous nor much trusted. The Chinese likewise have long produced jewelry of great artistic merit, and they so prize jade that they enjoy carrying a piece of it in their pocket to stroke and handle. Contrary to common opinion, the brilliant

CRUDE AND SPLENDID BYZANTINE ART



All of gold and precious stones is this reliquary in the Byzantine style, from the famous monastery of Mount Athos, Greece.

green jade is not always the most prized in China, but rather any rare color, such as pure white mottled with grass green, or spinach green flecked with gold, or translucent white like "mutton fat" with red spots.

There are many superstitions about gems, and as late as the 18th century powdered gems were employed medicinally. Sapphire was thought to relieve

insanity, powdered jet was taken for toothache, topaz for asthma. Superstitious people today wear amber beads to cure goiter, and some fear the dire power of the fiery opal.

TUTENKHAMON'S JEWELS

Gem stones are simply minerals valued for their beauty, rarity, and hardness. The precious gems are diamonds, rubies, emeralds, and sapphires; the semi-precious include topaz, spinel, opal, amethyst, moonstone, aquamarine, chrysoberyl, tourmaline, zircon, peridot, garnet, and others.

Pearls are not stones, but the natural product of the oyster. Coral is the skeleton of the coral polyp, and amber is a fossil resin. Fashion as well as other considerations may affect the value of any of these ornaments.

Certain imitation precious stones can be made in the chemist's laboratory. Some of the synthetic rubies and sapphires made today can be told from the real stones

only by experts. Artificial rubies are built up by allowing molten drops of chromium-aluminum oxide mixture, fused in a flame of illuminating gas and oxygen, to fall on a support and form a red pear-shaped mass or *boule* which is cut into gems when cool. Artificial sapphires are made by adding oxides of iron and titanium as pigment to aluminum oxide. About 20,000,000 carats of these rubies and 12,000,000 carats of sapphires are marketed yearly, mostly for use in watches and scientific instruments.

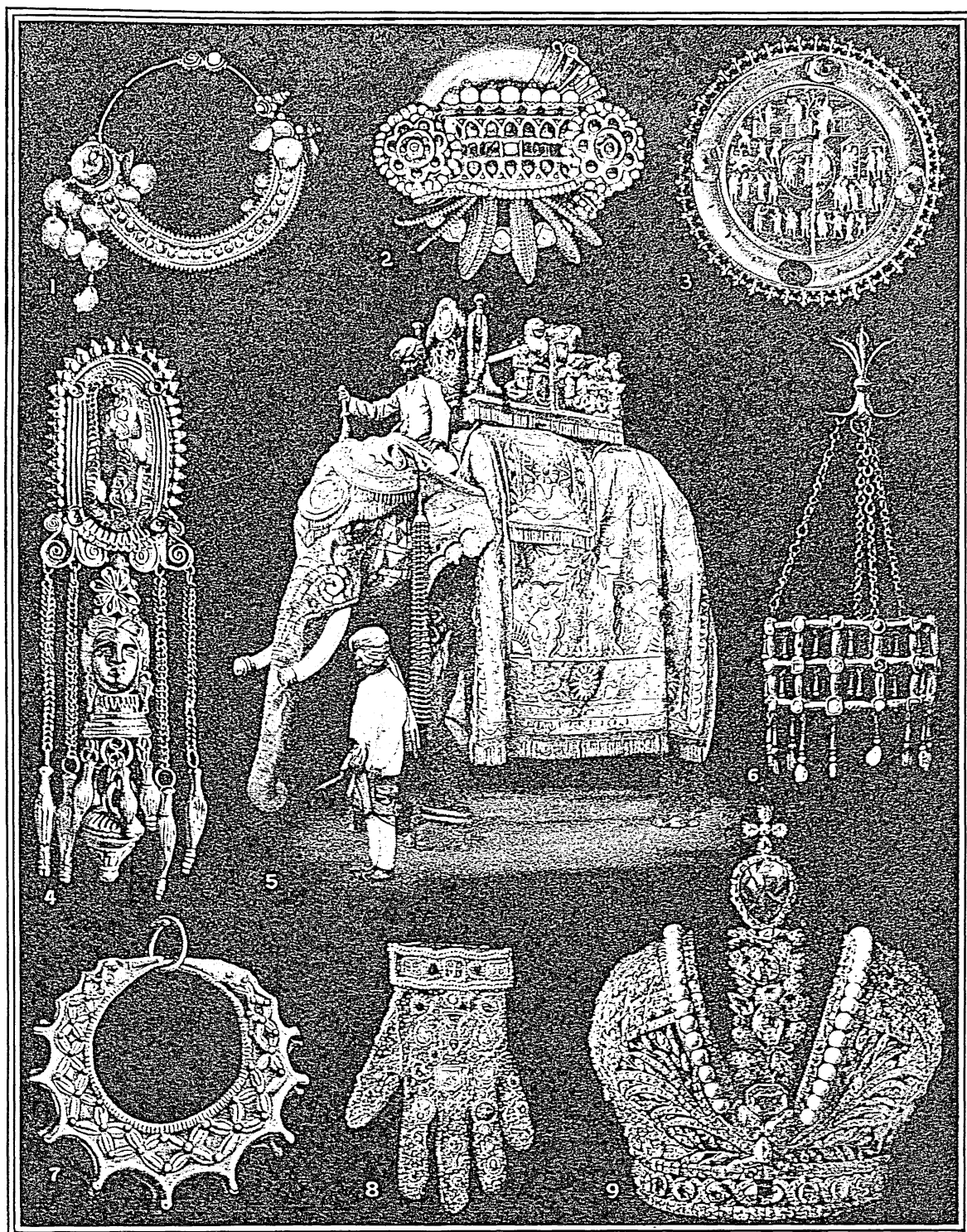
These synthetic stones are distinguished from the natural ones in three ways. Man-made stones are composed of curved layers, natural stones of flat layers. Air bubbles frequently occur in synthetic stones, rarely in the natural. Synthetic stones, when exposed to cathode rays, are said to continue glowing after the rays are switched off, whereas natural stones immediately stop glowing.

The making of imitation gems, as distinguished from synthetic stones, is an ancient art. The usual basis is a hard brilliant glass, called paste or strass, with a high percentage of oxide of lead. False diamonds are cut from the pure paste, while color is added for imitation amethysts, sapphires, etc. These mock gems are never as hard or brilliant as the real. "Doublets" are made by mounting a thin front layer of real stone on a paste back. The color of genuine gems is often improved by staining or by



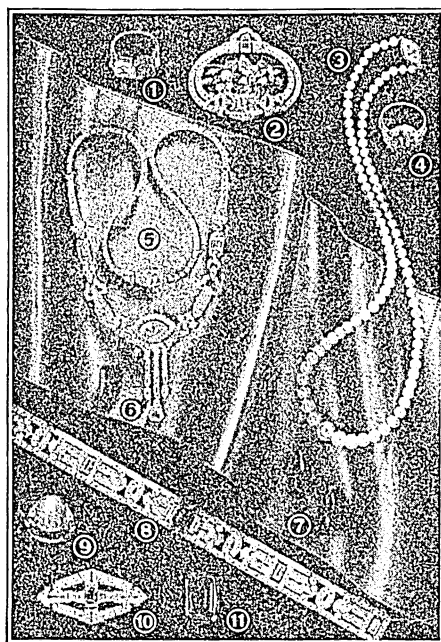
A modern Egyptian lad wears the "Honorific Order of the Birth of the Sun," once worn by Tutenkhamon. It is encrusted with semi-precious stones, strung upon an elaborate bead-work backing.

THE AGE-LONG LOVE OF ORNAMENT



No better designed jewelry is made anywhere than in India. 1. A nosering, and 2. a brooch, are typical of Indian ornament. 3. This crystal medallion, with its fine intaglio carving of the story of Susannah, was made for Lothair, king of the Franks, in the 9th century. Its mounting is 15th century. 4. Fine chains, scrolls, and figures adorn this Etruscan pendant, or earring, of the third century B.C. 5. A fine lady could not be more elaborately ornamented than this Bombay elephant, with his dangling earrings, gold-tipped tusks, fancy head-gear, and gorgeous gold-embroidered robe. He even has two bracelets on one huge ankle. 6. Gothic kings of the 7th century wore crude, massive crowns like this one from the eight found at Guarrazar, Spain, now in the Cluny Museum, Paris. The chains were added when the crowns were suspended in a church as a votive offering, and used to hold a lamp. 7. From the ancient, mysterious city of Mycenae in Greece, which thrived some 15 centuries B.C., comes this earring or pendant. 8. Gold, gems, and enameled plaques rather overdo the elegance of the gloves worn at the coronation of an emperor of the old Holy Roman Empire. 9. The imperial crown of Russia is said to be made up of flawless, perfectly matched stones.

FINE MODERN JEWELRY AND CUT STONES



KEY TO COLOR PLATE

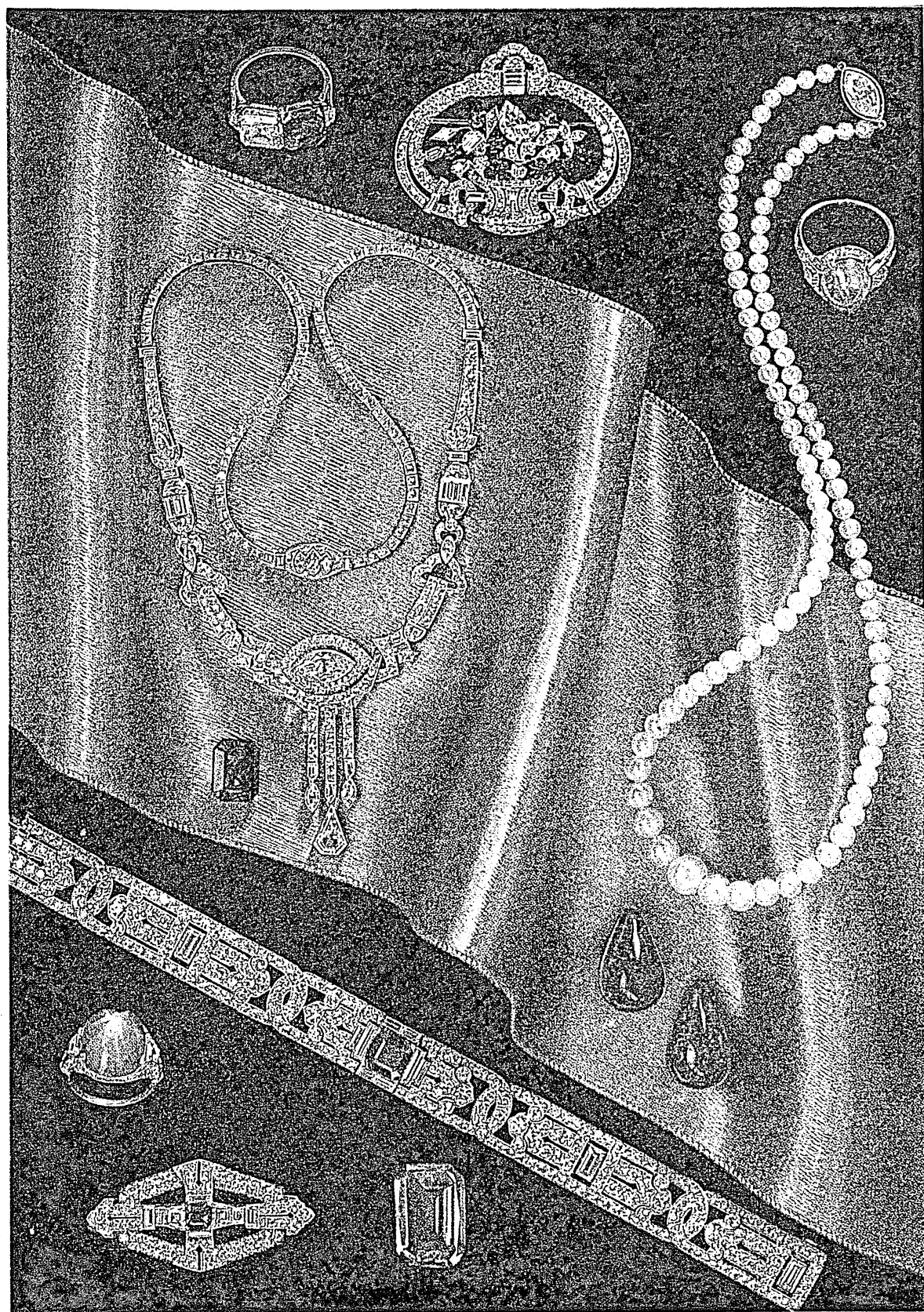
MODERN jewelers tend to suppress or subdue the settings of their finest pieces in favor of a better display of the stones. The use of platinum helps in this respect, for it is less obtrusive in color than gold and its greater strength makes lighter settings possible without sacrificing the security of their grip upon the gems.

The picture on the opposite page shows some good examples of this tendency. The various pieces can be readily identified by referring to the small key-picture here. When worn on the finger, the diamond-and-emerald ring (1) would show little more than the stones themselves, both of which

are cut "emerald style" to keep a larger surface. The diamond-and-emerald brooch (2) shows one of the older "picture" patterns, with the stones arranged to suggest a basket of flowers. But here, too, virtually all the effect is obtained through the stones alone.

In contrast to this elaborate design is a necklace of perfectly matched pearls (3), probably the most popular piece of jewelry today, as well as the most expensive. This example bears a fine marquise-cut diamond in its clasp. The ruby ring (4) shows a stone cut in cabochon style, rounded and polished. The neck-piece (5) includes, among other oddly cut diamonds, a kite-shaped stone for its middle "drop." The loose emeralds (6 and 7) show the contrast between the typical "emerald cut" gem and the pear-shaped drops.

The other pieces are a diamond-and-platinum bracelet (8) set with a dark ruby, a ring set with a star sapphire (9) which is always cut in this style to show its "rays," a diamond-and-emerald brooch of severe modern design (10), and a large ruby (11).



Direct-color photograph, nine-tenths actual size

See text on opposite page

FINE MODERN JEWELRY AND CUT STONES

treating them with heat or radium. Opals are frequently heated in a bath of oil.

Interesting facts about various gems are given in the list below:

Agate. A type of chalcedony, with colored bands, first found on banks of river Achates, hence the name agate. The markings of moss agates occasionally resemble natural objects, hence were much prized in the past. Most agates are naturally grayish and are artificially colored.

Amethyst. A quartz found in Brazil, Ceylon, and Siberia. Heat turns it yellow. Worn by ancients to prevent intoxication; many wineglasses were made of it in ancient Rome. Was formerly ten times as valuable as today.

Aquamarine. A sea-blue or sea-green beryl, of the same class as the emerald but far less valuable.

Aventurine. A quartz spangled with yellow mica or other mineral. Also called goldstone.

Azurite. An azure-blue copper carbonate found in most copper mines, usually directly above a layer of green malachite. Pliny calls it *caeruleum*. Value not great.

Beryl. A silicate of low value, though related to the emerald. May be green, light blue, yellow, pink, or white.

Bloodstone. A quartz, dark green with blood-red spots, prized in Middle Ages for carvings of martyrs. Also called heliotrope. Found in Persia, Siberia, Colorado.

Cairngorm. Black or smoky yellow quartz, changed by heating to dark brown or yellow. National stone of Scotland; also called Scottish topaz. Often nearly opaque.

Carbuncle. A garnet cut *en cabochon*, that is, flat on the bottom, rounded above, without facets. In ancient times any red stone was called a carbuncle, and a mythical "carbuncle" was said to give out light in darkness.

Carnelian. Name given to brown and red chalcedony. Much used for engraved seals in ancient times.

Cat's Eye. The cheaper cat's eye is of quartz, the more highly valued is of chrysoberyl. Colors range from apple-green to olive, from yellow to brown, but each has a streak or line through the middle, of varying brilliance, like a cat's eye. Hindus value the stone second to the diamond.

Chalcedony. A cryptocrystalline quartz, used by gem engravers in all ages. Called onyx, sardonyx, sard, and carnelian, according to staining.

Chrysoberyl. A rare, unusually hard stone. One variety, the alexandrite, green by day and red by lamplight, had a great vogue among Russian aristocrats.

Chrysolite. An olive-green vitreous magnesium iron silicate, also called olivine and peridot. It is crystalline and when transparent, used as gem.

Chrysoprase. An apple-green type of chalcedony, found in Oregon, California, and Silesia.

Cymophane. Same as cat's eye.

Diamond. Pure crystallized carbon; hardest known substance, is fairly brittle and easily split, contrary to popular belief that a diamond may be pounded with a hammer and will not break. World's diamonds are said to be worth \$5,000,000,000. (See Diamond.)

Emerald. When large, brilliant, and flawless, the emerald is the costliest of gems. Composed of silicate of aluminum and beryllium. Chief source of deep green emeralds is Colombia. Some of the most beautiful come from North Carolina.

Garnet. A deep red stone, of two varieties, almandine or almandite, and pyrope or Bohemian garnet. When cut *en cabochon*, both are called carbuncles. The Bobrovka, or green garnet, resembles emerald but is not hard. Olivine is erroneously called green garnet. Hyacinths are garnets.

Heliotrope. Same as bloodstone.

Hematite. A valuable iron ore, occurring in pure crystals, blackish or dark red, popular in modern costume jewelry.

Jade. A name applied to jadeite, nephrite, and chloromelanite. Jewelry, cups, altar-pieces, and bells or sounding stones are made of it, and poems of emperors have been carved in priceless jade bowls. It does not occur naturally in China, but is imported from Burma. It is also found in Siberia, New Zealand, Mexico, and Europe.

Jasper. An opaque quartz, a variety of chalcedony, putty color, red, or yellow, mined in Egypt and Russia, much used in Russia for vases, tables, mantels, and pillars.

Jet. A hard black lignite, or variety of fossil coal, mined in Great Britain, China, and elsewhere. Light in weight.

Kunzite. A variety of spodumene, transparent, lilac in tint, named in honor of Dr. George F. Kunz of New York, discovered near Pala, Calif., in 1902.

Labradorite. A pearl, gray, or brown feldspar, showing many colors in light. Takes high polish.

Lapis Lazuli. Mines in Afghanistan, worked for 6,000 years, probably world's oldest mines. Called "sapphire" by ancient world. Finest varieties are gold-flecked with iron pyrites. Cracked quartz stained blue is sold as "Swiss lapis."

Malachite. Colors range from dark to grass green, streaky, much used in Russia. Occurs large enough for table tops.

Marcasite. Metallic stone, ranging from slate-gray to bronze-yellow, same composition as pyrite, often set as brilliants in modern costume jewelry.

Moonstone. A variety of translucent feldspar; has a moony flash; best specimens found in Ceylon.

Obsidian. A smoky natural glass of volcanic formation, abundant in Yellowstone Park. Used by early Mexicans and North American Indians to make mirrors, arrow-heads, and knives.

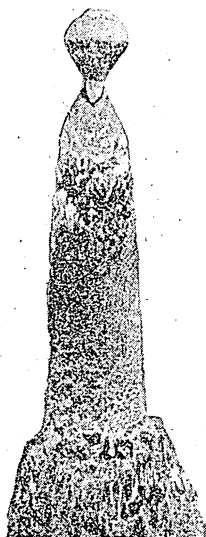
Olivine. Same as peridot and chrysolite, differing only in color.

Onyx. The cameo carver's favorite material. Quartz, or chalcedony, with

RUBIES FROM MINE AND CRUCIBLE



In Burma, where the best rubies are found, the patient natives sort piles of gravel in their hands, much as we might sort cranberries, and their sharp eyes find the rubies among the worthless pebbles. This gravel bank is at Mogok, Burma.



Artificial rubies are built up in the furnace by allowing the melted chromium and aluminum, as formed, to drip on a matrix, thus building up the gem as the drip of water builds up an icicle on the edge of a roof.

horizontal stripes of black and white, found in South America and India.

Opal. Harlequin opals have flashes of color throughout, fire opals are yellow or red with a shifting glow, black opals are dark with colored lights. Occur in Hungary, Australia, Mexico, and Nevada. World's largest opal, size of half a brick, black with green and blue fire, found in Nevada. Reputation for ill luck may be due to fragility of stone and occasional loss of brilliance.

Pearl. Not truly a gem stone, but the product of pearl oysters. (See Pearls.)

Peridot. Same as olivine and chrysolite.

Pyrite. A metallic, pale yellow, opaque iron disulphide.

Rhodonite. A red or rose stone, streaked with black, of manganese and silica; much prized in Russia.

Rock crystal. A quartz much used for beads, vases, goblets, and crystal balls.

Ruby. A transparent red corundum valued according to shade of color. Best grade found in Burma, others in Siam, Ceylon, North Carolina, Montana. Most valuable shade is "pigeon's blood." Fine rubies of 4 or more carats are worth from 2 to 5 times as much as diamonds same size. Seldom weigh more than 8 or 10 carats. Ruler of Bishenpur, India, has one ruby weighing $50\frac{3}{4}$ carats, another weighing $17\frac{1}{2}$ carats. In Burma rubies are sold only from 9 a.m. to 3 p.m., on clear days, because they can best be judged by sunlight.

Sapphire. A transparent corundum, or aluminum oxide, found mainly in Burma, Ceylon, Siam, and Cashmere; lesser qualities in Australia and Montana. Best shades "corn flower" and "velvet" blues. Largest known weighs 916 carats.

Sardonyx. A variety of chalcedony with brown and white stripes or layers of chalcedony and carnelian.

Spinel. Composed of magnesium and aluminum. Clear spinels are valuable; red ones called "spinel rubies."

Topaz. Scotch topaz is yellow quartz, Oriental is yellow

sapphire, Brazilian is true topaz. When heated, yellow topaz turns pink. "World's largest diamond," among Portuguese crown jewels, may be colorless topaz. Topaz may be blue, green, brown, pink, white, or yellow.

Tourmaline. A silicate, either black, brown, blue, green, red, or colorless, various colors having different names. Found in Brazil, Siberia, Maine, and California.

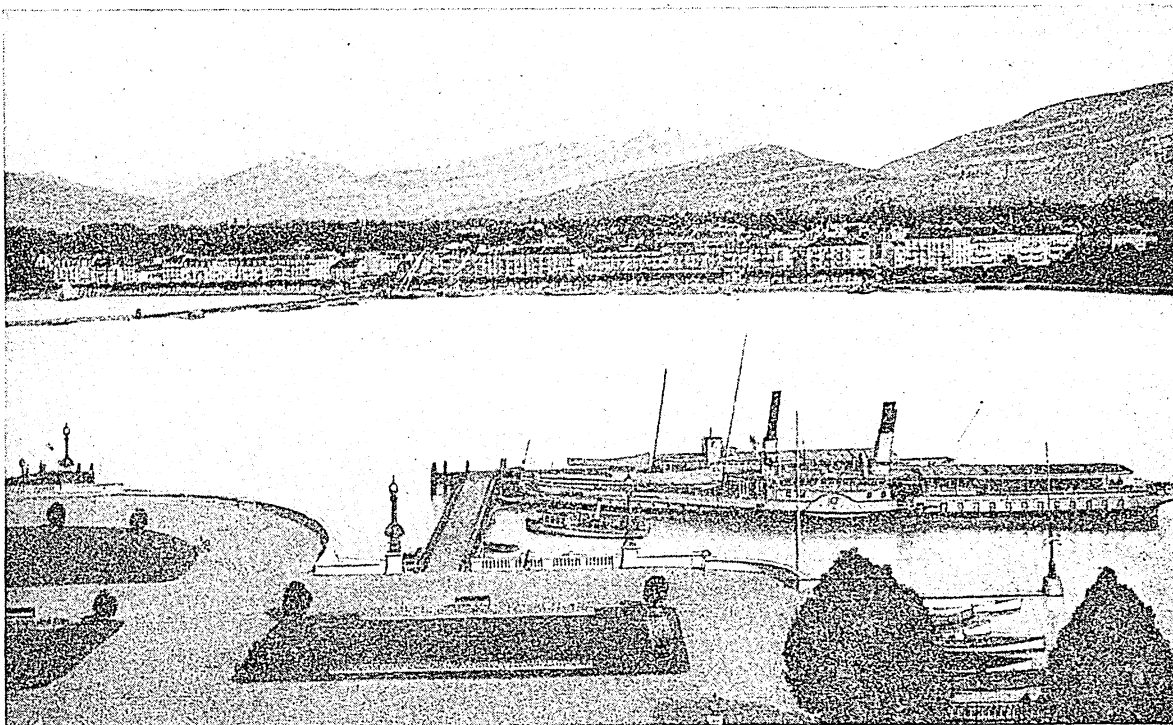
Turquoise. An aluminum phosphate, from sky-blue to apple-green. Best grade from Persia, where it has been mined for 800 years. Also found in California, New Mexico, and Nevada. Heat and sunlight fade turquoise or turn it green. Turquoise matrix is mottled with natural rock.

Zircon. Has recently become fashionable in America. Is found in Ceylon, Australia, Europe, and South America. Natural colors are blue, brown, and green, but are frequently heat-treated to secure greater brilliancy, and colors have been known to fade. Closely related to the hyacinth (red), jacinth (yellow), and jargoon (white) differing only in color.

GENE'VA (French *Genève*, German *Genf*), SWITZERLAND. "A bird's nest of a place; the most lovely spot and the most notable, without any possible dispute, of the European universe." This is what the great art critic Ruskin said of Geneva. The city nestles in a cup of the Alps at the lower end of Lake Geneva (*Lac Lemman*) whence issues the Rhone River. The river forms two little islands in the city, one of which is named after the great revolutionary writer Jean-Jacques Rousseau, one of the city's famous sons.

Because Switzerland's policy is to keep out of European alliances and disputes, this beautiful and leisurely city has long been a center for many international organizations. Here delegates from many

BEAUTIFUL LAKE GENEVA AND ITS LOVELY CITY



We are looking across the southwestern end of the crescent-shaped Lake Geneva from one of the public gardens of the city of Geneva. On the opposite bank is the newer part of the town, where are situated the many hotels patronized by tourists. Back of the city rise great barren rocks and beyond them glitter the eternal snows of the Mont Blanc chain. It is at this point that the Rhone River runs out of the lake.

nations have discussed their problems and striven for peaceful settlement of their disputes.

The spacious building of the League of Nations is in Ariana Park on the outskirts. The League moved to this building in 1936 from the headquarters it had occupied for its first 15 years. Geneva is also the headquarters for the International Red Cross (established here in 1864), the Students' International Union, the Geneva School for International Studies, and the Interparliamentary Union—to mention only a few. Although the League of Nations and many other organizations could not carry on all their work as usual during the second World War, they did continue many of their activities, either at Geneva or elsewhere. Some of the League groups moved to the United States. The staff of the International Labour Office moved to Montreal.

During the Reformation, Geneva was known as the "Rome of Protestantism." John Calvin made his headquarters here from 1536 until his death. Calvin practically ruled the city and gathered about him many other Protestant reformers (*see* Calvin, John). In 1559 Calvin founded an academy which became part of the University of Geneva in 1873. For many years the city has been noted as a cultural center. Voltaire lived for years at near-by Ferney; and when Napoleon rose to power his bitter enemy, Madame de Staël, established her famous *salon* in a château on the north side of the lake, at Coppet. Everything here remains just as she left it, and the château attracts many visitors. Broad tree-lined promenades and luxurious tourist hotels surround the lake in Geneva, and handsome homes face its clean streets. The city has beautiful university buildings, and magnificent palaces house the international organizations. Snow-clad Mont Blanc, 40 miles to the southeast, tops its fringe of Alpine peaks. The chief manufactures are watches, jewelry, scientific instruments, machinery, and chocolate. The population is 125,000. (*See also* Switzerland.)

Beautiful Lake Geneva, 45 miles long and 9 miles wide, is the largest lake in Switzerland. At the other end from the city of Geneva, near Montreux, is the Castle of Chillon, made famous by Byron's poem, "The Prisoner of Chillon".

GEN'OA, ITALY. The beauty-loving Italians call Genoa "La Superba"—The Proud. Rising from the Gulf of Genoa in white relief against the sharp slopes of the Apennines, it is a magnificent sight. Along its steep streets are superb medieval churches and ornate marble palaces of Renaissance times. Proud, too, is the city's heritage, for Genoese mariners made some of the boldest voyages of discovery and conquest. And here, at the harbor edge, the young Christopher Columbus dreamed of faraway lands.

Since the Middle Ages Genoa has been a thriving port, for it is one of Italy's few outlets on the west coast. This situation later became an enormous advantage when the tide of commerce turned westward, for it lay nearer the Atlantic than its old rival Venice. Today Genoa is Italy's chief port and the gateway to

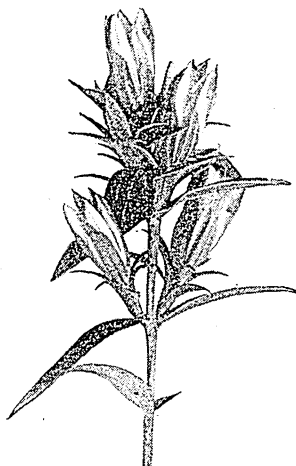
the great northern plains which are the heart of the nation's agriculture and industry. Linked to Switzerland by the great Simplon and St. Gotthard tunnels, it handles much of the bulky imports destined for that nation and for southern Germany. With its warehouses, storage tanks, foundries and shipyards, it is a bulwark of Italy's industry. Hence, during the second World War, it was bombarded from the sea and the air by the British forces.

The city has an eventful history. Both the Lombards and Franks once held it, but, when Charlemagne's empire broke up, it became an independent city. It fought a long series of wars with Pisa, its southern neighbor, in which the latter was crushed in 1284. A similar series of wars, due to commercial rivalry with Venice, ended with Genoa's disastrous defeat at Chioggia in 1380. The aristocratic and the democratic factions were in constant turmoil up to the 16th century, when the autocratic rule of the doges began.

The noted Bank of Genoa, founded in the 12th century, presented in the Middle Ages the spectacle of a small group of merchant capitalists who virtually dictated laws and gave orders to the government. This historic wealth is reflected today in an imposing array of fine churches, palaces, schools, libraries, and museums. The city has a flourishing university, founded in 1471. Corsica, the last of the city's foreign possessions, revolted and was taken by France in 1768. Sardinia-Piedmont acquired the city in 1815, and it became a part of the kingdom of Italy with the union of the peninsula under the Piedmontese kings. Population, about 625,000.

GENTIAN (*gên'shūn*). When the September woodland borders are touched with gold and red and the

BLUE AS THE SKY



The Gentian flower, named after an ancient king. At the coming of fall the downy Gentian unfurls its blue blossoms.

meadows and thickets, browned by the hot summer sun, are cooled by the autumn breezes, a flower of heavenly blue rises among the bright goldenrod and bursting milkweed, waving and nodding its proud head before the gay world. Long, long ago, so it is said, Gentius, king of ancient Illyria, discovered that a medicine could be produced from the root of this lovely plant, and it is in his honor that it is named. In Switzerland, on the slopes of the Alps, whole pastures are blue with it.

The fringed gentian of North America, rarer each year owing to thoughtless gathering, has a tiny fringe around the edge of its four pretty petals. These blue flowers grow from Quebec

southward to Georgia and west beyond the Mississippi, blooming from September to November. When the darkness falls they fold their beauty until the smiling sun beckons them out again:

Then doth thy sweet and quiet eye
Look through its fringes to the sky,
Blue—blue—as if that sky let fall
A flower from its cerulean wall.—*Bryant.*

Another of the more than 300 species is the closed gentian, whose clustered flowers never open. A

few rare species are white, yellow, or red, the latter being found in the Andes. In the Catskills of New York a five-flowered gentian of conspicuous yellow is found.

Scientific name of fringed gentian, *Gentiana crinita*. Flowers solitary and stiffly erect at the end of a long stalk; calyx of 4 unequal lobes; corolla, funnel form; 4 stamens inserted in the corolla tube, and 1 pistil with 2 stigmas. Stem from 1 to 3 feet high, leafy and branched. Leaves opposite, acutely tipped on top, gradually broadening to heart-shaped.

Our WIDE, WIDE WORLD—Its Lands and Peoples

Vast and Varied Panorama Presented in the Study of Geography—Getting at the Secret of the Growth of Cities—Thrilling Stories Back of the Maps of the World

GEOGRAPHY. On the other side of the earth, in the hot wet island of Borneo, are the savage Dyaks, who live in houses set on piles along the rivers, hunting game with spear and blowgun and planting crops of rice and vegetables. Up in arctic Labrador the sturdy squat Eskimos dwell amid snow and ice, getting their food and clothing from the animals of sea and land. The patient Chinaman, bent with toil, works day and night in his little terraced rice field, up to his knees in water, using his bare feet to pack the mud around the young rice plants and to pluck the weeds. So many are the mouths he has to fill and so tiny his field that the failure of a crop means death to hundreds of thousands.

Along the Nile the Egyptian fellah laboriously lifts the water of the river by long sweeps into the ditches that irrigate his field. On the vast prairies of North America farmers drive great gang plows drawn by six, eight, or ten horses or by mechanical tractors, producing enormous crops of grain to feed the hungry world. On the immense treeless steppes of central Asia, where there are no mild ocean breezes to temper the cold of winter and the extreme heat of summer, the Kirghiz and Mongols wander about pasturing their flocks and herds on the tall grasses. In the sweltering fever-ridden jungles of the Amazon, naked savages, too low in civilization to have learned to plant crops, live on the fruits and nuts of the trees, the fish of the rivers, and the animals they slay; while only a short distance to the west, still near the Equator, the mountain shepherds of Bolivia dwell on the lofty heights of the Andes, where it is so cold only the hardest crops will grow and men would perish but for the food and clothing they get from their flocks of llamas.

How Geography Helps Tell Men's Fortunes

Why do the peoples of the world differ so widely in the way they live, in dress, appearance, customs, intelligence? The fascinating science of geography tells you. It shows how land and ocean, rivers and mountains, plains and valleys, temperature and wind and rainfall, in large measure control the ways in which men live and the degree of civilization they attain.

Here and there men have come together into great cities, each with an individuality of its own and each

crowded with interest to the wide-awake mind. London, Paris, Constantinople, Peking, Cairo, New York, Chicago, Quebec, Bombay, Buenos Aires—every name is a flash of romance and mystery. Why did these great cities spring up at just those spots? Geography tells you. It shows how some, like New York and London, owe their existence chiefly to their excellent harbors. Others, like the manufacturing cities of the Atlantic states, grew up on the edge of the Piedmont plateau—the broken hilly country between the coastal plain and the inland mountains, where the abundance of water-power was favorable to the growth of manufactures. Some, like Chicago and Winnipeg, have come to greatness because they stand at strategic points on great trade routes. Others, like Pittsburgh and Sheffield, have been made by the proximity of great iron and coal deposits.

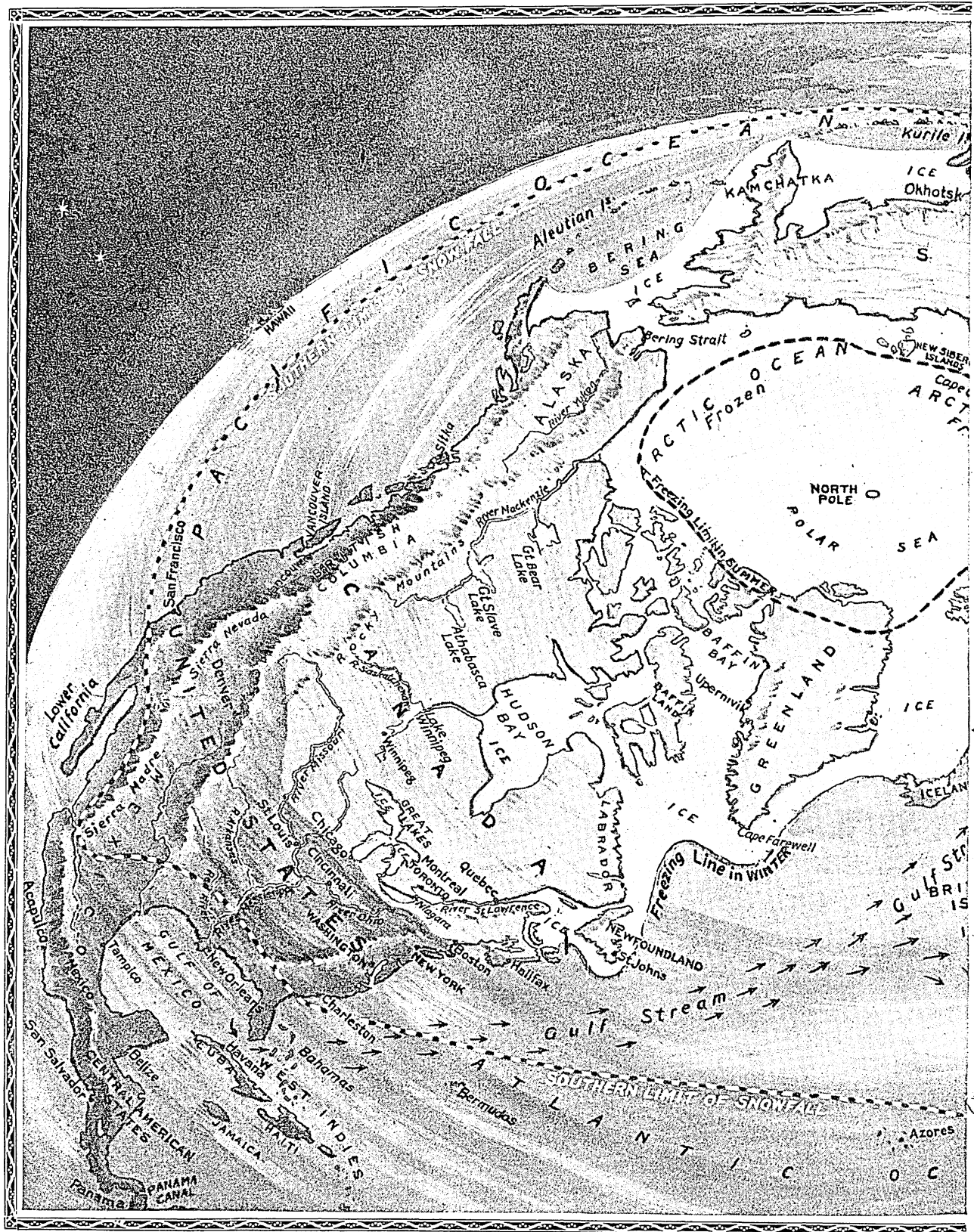
And so one might go on for pages, merely suggesting some of the myriad interesting things the study of geography has to tell us about the earth as the home of man. But this, while the most interesting and important of the aspects of geography, is only a part of the story. As its name shows, geography (from the Greek words meaning "earth" and "to write") is a description of the earth. Its vast subject-matter naturally falls into several main divisions, which are variously classified. The simplest division is into mathematical geography, physical geography, and biogeography, or the geography of living things.

Relation of Geography to the Story of the Stars

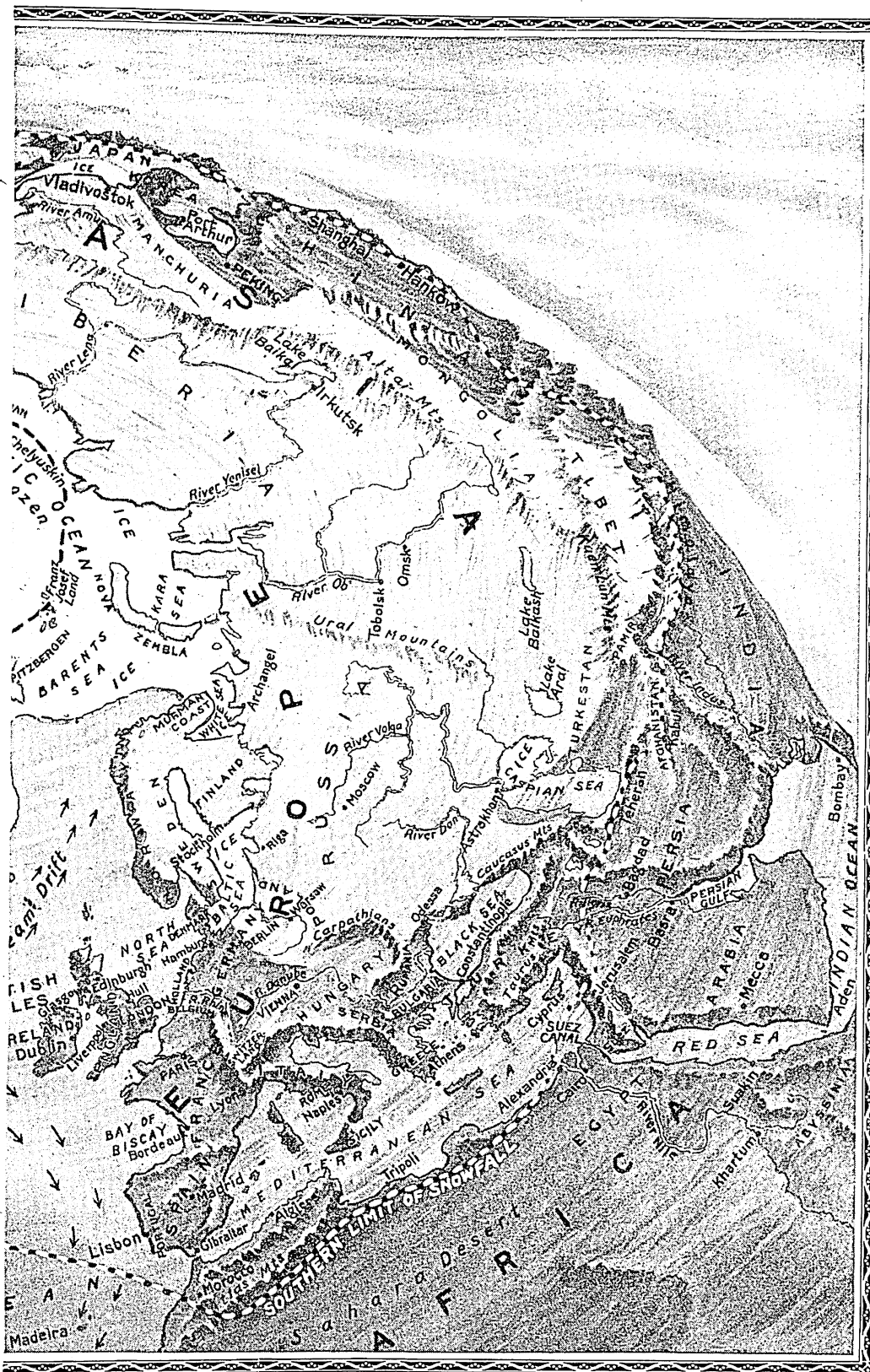
Mathematical geography treats of the form, size, and movements of the earth from the standpoint of mathematics. In considering the movements of the earth and its place in the solar system, it is closely connected with astronomy. And since it also has to do with the measurement of the earth and the various methods of representing its surface on maps, it is related to surveying and cartography or map-making.

Physical geography, which is practically identical with physiography, as the term is commonly used, treats of the physical features of the earth—land, sea, and atmosphere. Geology, oceanology, climatology, and meteorology all contribute to supply the data of this department (*see* Physiography).

THE HUGE STAGE ON WHICH



LIFE'S DRAMA IS PLAYED



Thinking of the Earth as the home of man, and Geography as the science that deals with it as such, what a magnificent subject for investigation and reflection this view of the globe provides us! Here we have the theater on which almost the entire drama of the world's history has been enacted.

Beginning with the cold and barren region in which the Eskimos, the Lapps, and other Arctic peoples have made such difficult progress, and have overcome the obstacles of climate and situation in so many ingenious ways, we pass down through the temperate regions where the civilization of today has reached its highest point. Further down we reach lands with climates so mild and friendly that fewer obstacles were offered to man's progress. Here the oldest civilizations grew up, the civilizations of Egypt, Babylonia, Greece, and Rome.

In imagination we can people this map with the Siberian hunters in their land of snow and ice, with the prosperous farmers busy at their great harvest on the prairies of North America, with the patient Chinamen toiling in their terraced rice fields, with the Egyptian "fellahs" patiently lifting the Nile water with their long sweeps, and with the wandering Mongols driving their flocks and herds over the immense steppes of Central Asia. With this picture before us, we can reflect "how land and ocean, rivers and mountains, plains and valleys, temperature and wind and rainfall control the ways in which men live."

Finally comes the great department which treats of the living things that dwell on the earth, their distribution and life conditions, culminating in the geography of man. Man is the animal that has learned to conquer and control geographical conditions. By great engineering works he modifies the earth's surface to his advantage. He drains and irrigates the land, tunnels through mountains, reclaims land from the sea, and even severs continents by canals. By cultivation and breeding he changes the distribution of animals and even produces new varieties. All other branches of geographical study are subordinate to this crowning department and focus in it. Hence human geography, as it is sometimes called, is further divided into various subdivisions, such as political geography, which deals primarily with the distribution of the human race, and economic or commercial geography, which treats of the manufacture and distribution of the world's products (*see* Commerce; Transportation).

The progress of geographical knowledge has depended largely on the progress of discovery. The Phoenicians were the first people who communicated to other nations a knowledge of distant lands. Their voyages before the time of Homer, through the Euxine, the Mediterranean, and even into the Atlantic, form the first link of the great chain of discovery which, centuries later, was extended by Columbus to the shores of America. Travelers like the Greek historian Herodotus did much for the advancement of geography, as did also the exploring and surveying expeditions of Alexander the Great. At the same time Pytheas, the Massilian navigator, was following the path of discovery in the north, possibly as far as Iceland. About 200 B.C. Eratosthenes first used parallels of latitude and made maps on mathematical principles. By this time the old idea of the earth as a flat circular shield surrounded by a rim of water had given place to the belief that the earth is a sphere, rotating with the surrounding atmosphere on one axis. The practical genius of the Romans led them to make a study of the resources of the countries they conquered, which did much for geography. In the 2d century of our era Ptolemy wrote a work on geography, in eight books, which remained the authority for many centuries.

How Men Put New Countries on the Map

For the next thousand years, there was little travel or exploration. In the 10th century the Northmen pushed far out on the western ocean, and in the 13th century Marco Polo journeyed overland to China. But it was not until the days of Prince Henry of Portugal that the Age of Discovery began. Columbus found the New World at the end of the 15th century, and Vasco da Gama sailed around Africa. Within 30 years the whole coast of America, from Greenland to Cape Horn, had been explored; the Pacific Ocean had been navigated by Magellan and the world circumnavigated by his ship; the coasts of eastern Africa, Arabia, Persia, and India had been visited; and numerous

islands in the Indian Ocean discovered. The attempts to find a northwest passage to India increased the knowledge of the Arctic regions. In the 17th century the Dutch made known to the world the Australian Islands (which the Portuguese had discovered a few years before). Captain Cook in his three voyages completed our knowledge of most of the Pacific lands.

The Great Work of the 19th Century

At the beginning of the 19th century explorers were familiar with the outline of the continents and most of the islands, but four-fifths of the land area was still practically unknown. There was only the scantiest knowledge of central and eastern Asia, and of the interior of the Americas. Africa was still truly the "Dark Continent." Most of the Polar lands were still undiscovered and the existence of the vast Antarctic Continent was derided as an empty fable. By the close of the century, most of these immense gaps in geographical knowledge had been closed by the labors of such heroic explorers as Lewis and Clark, Fremont, Pike, and Selkirk in North America; Parry, Franklin, the two Rosses, McClure, Kane, Nansen, Peary, and a score of others in the Polar regions; Livingstone, Stanley, Burton, Speke, and Schweinfurth in Africa; Younghusband and Sven Hedin in Asia. But it was not until our own century that the veil was torn from the two chief objects of exploration—the North Pole, attained by Peary in 1909, and the South Pole, by Amundsen in 1911 and Scott a month later (*see* Polar Exploration).

The work of extending geographical knowledge is still going on. There are vast tracts in northern Asia, central Africa, South America, Arabia, and Australasia of which we have only scanty knowledge. There is also much to be done in the study of the ocean and the atmosphere. Aerial photography has been a great aid in exploring difficult regions, such as the densely forested areas of South and Central America, and the icy mountains of Alaska. Aerial observers can map accurately in a few hours a stretch of territory which could otherwise be covered only by difficult and dangerous journeys of weeks or months.

Geographical societies and associations have performed an important part in obtaining and spreading geographical knowledge. The first of these was founded in Paris in 1821. The first in the United States was the American Geographical Society, organized in 1852, and the next was the National Geographic Society, founded in Washington in 1888. Members of these associations undertake distant travels, sometimes at their own expense, sometimes aided by funds from the society or the government. The information collected is given to the world in lectures, books, and periodicals. The story of the latest chapters in geographical exploration is told in the article on Exploration.

The volumes of this work cover in their alphabetical place practically every topic touched in geography—continents, countries, states, cities, rivers, lakes, oceans, mountains, etc. In the Reference-Outline on the following pages the topics are arranged in their proper order and related so that the reader can survey the whole field of geography.

—REFERENCE-OUTLINE for Organized Study of GEOGRAPHY—

IF YOU could from memory make an accurate map of every country in the world, placing every mountain, every river, every gulf, every island, every boundary, every city in its exact and proper place, you might still know very little about geography. This does not mean that maps and map making are unimportant. On the contrary, it would be almost impossible to study geography without them. But it does mean that they are nothing more than the *tools* we use in putting together and arranging our really vital knowledge.

You will miss the whole point and fascination of geography unless you learn to see a map as you see the frame of a picture, which your imagination fills with visions of bold scenery, flowing rivers, cloud-capped mountains, fertile plains, great green forests, and wind-swept deserts. You must learn to hear in your imagination the roar of the surf on distant shores, to feel the bite of the polar cold and the oppressive heat of the tropics. But, above all, you should see in your mind's eye the millions of people that inhabit the globe, watch them at their work and play, learn what they are all doing, and why. Why have they crowded into great swarming cities here, and why are they scattered in thin settlements there? What are those crops they grow with such care? What are they making in those workshops and in those great factories? What riches are being carried in those speeding railway cars? And those countless ships plowing to and fro over the oceans—where are they bound, and what do they bear beneath their tossing decks? Those are the questions you should ask yourself, and the pictures you should see as you glance at a map.

Geography is the study of the Earth *as the home of man*. Viewed in this light, it becomes a broad and interesting subject. It deals with such things as the races of mankind, their character and their customs; the influence of climate upon crops and industries; the kinds of plants and animals that thrive in various regions; the ties of trade that bind nations and peoples together; the causes of wealth and poverty in different parts of the world—in fact, with the whole *present* structure of civilization. In so far as the past physical history of the world helps us to understand the present, geography enters the special field of geology. And in so far as the past customs of peoples have influenced their present customs, it enters the field of history proper.

This outline deals chiefly with the broad aspects of physical geography and with the growth of geographic knowledge through exploration and trade expansion. The other fields of geography discussed in the preceding paragraphs are presented in the Reference-Outlines for the various continents and countries of the Earth, and in such outlines as those for Sociology, Political Science, Economics, Races of Mankind, Industries and Industrial Arts, and Agriculture.

The Earth as a Whole and Its Relation to the Sun

- I. THE EARTH: E-128. (The Reference-Outline for Astronomy should also be consulted in connection with this phase of geography study.)
- A. Form, Size, and Composition of the Earth: E-130, E-132, E-128 picture.
 - a. Gravitation: G-140-3, E-130, E-132, E-135.
 - b. Magnetism: C-325, E-132.

B. Motions of the Earth:

- a. Rotation on Its Axis: E-133-5.
—Axis Not Perpendicular to Plane of Orbit E-133.
- b. Movement in the Solar System: E-132, P-230, A-341-2, S-326, S-327 picture.

C. Results of Earth's Motions:

- a. Rotation on Axis Causes Day and Night: D-21, E-132.
- b. Revolution Around Sun, Coupled with Inclined Axis, Causes Changing Seasons: E-133, S-71.
—Equinox and Solstice E-299, E-133 picture; Aphelion and Perihelion S-71.

II. ZONES OF THE EARTH: C-270.

- A. The Tropical, or Torrid, Zone Between Tropic of Cancer and Tropic of Capricorn: L-70-1.
- B. Frigid Zones, the Regions within the Arctic and Antarctic Circles: L-70-1.
- C. Temperate Zones, Regions of Moderate Heat and Cold: C-270-1.

III. THE SUN—THE POWER PLANT OF THE EARTH: S-326.

The Story of the Earth's Materials

I. GEOLOGY: G-39. PHYSIOGRAPHY: P-197.

Note: Geology deals with the history of the Earth's crust and of the materials that compose it. Physiography deals with the characteristic relief features of the Earth's surface and with the causes that produced them. For the purposes of physical geography, these two sciences should be reviewed together, leaving such portions of geology as deal with the ancient history of *life* upon the Earth to be studied in the Evolution Section of the Biology outline. Here we shall deal first with the physical composition of the Earth under three headings: *Atmosphere*, or Air, *Hydrosphere*, or Water, and *Lithosphere*, or Rocks and Soil. Then we shall study the features of the Earth's surface and their origin.

II. ATMOSPHERE OR AIR:

- A. Nature and Functions of the Atmosphere: A-61.
 - a. Chemical Composition of the Atmosphere: A-61.
 - b. Weight of Air: A-62.
 - c. Air Resistance and Air Pressure: A-62.
 - d. Height of the Atmosphere: A-63 picture, A-62.
—Effect of Lack of Atmosphere on the Moon M-250.

B. Atmosphere and Climate: C-270.

Note: Bear in mind in this section the enormous influence that climate exerts upon the Earth's surface, upon the distribution of plants and animals, upon crops, upon communications, upon customs—in fact, upon everything with which geography deals.

a. Temperature: C-270.

1. Definition of Temperature H-262.
2. How the Earth Gets Heat from the Sun H-261, S-326.
3. Effect of Bodies of Water on Temperature W-42-3.
4. How Temperature Is Measured with the Thermometer T-78.
5. Temperature and Weather Maps—The Meaning of "Isotherms" W-60.

b. Moisture:

1. Moisture in the Atmosphere A-62, W-42.
2. Relative Humidity and What It Means E-339.
—How Moisture Is Measured with the Hygrometer H-375.
3. How Moisture Gets into the Atmosphere by Evaporation E-339, R-46.
4. How the Atmosphere Releases Moisture by Condensation and Precipitation D-58, R-46.
—Clouds C-281, C-280 pictures; Fog F-132; Dew D-58; Rainfall R-46; Hail H-195; Snow S-173-4; Frost F-209-10.

5. Effect of Rainfall on Vegetation R-46.
6. How Rainfall Is Measured R-48.
- c. Pressure of the Atmosphere: A-62.
 1. Variations in Air Pressure B-49.
 2. The Meaning of "Isobars" W-60.
- d. Movements of the Atmosphere—Winds: W-112.
 1. Causes of Winds W-112.
 2. Effect of Winds on Climate C-271.
 3. Relations of Winds and Rainfall R-46.
 4. Various Kinds of Winds and Wind Zones: Trade Winds, Doldrum Belt, Westerlies W-112-13; Monsoons W-113, I-32-3, P-165; Chinook A-110, B-246; Sirocco W-113.
- e. Storms: S-298.
 1. Cyclones, Hurricanes, and Typhoons C-418.
 2. Tornadoes and Waterspouts W-52.
 3. Thundershowers R-46; Lightning L-134-5.
- f. The Weather Bureau and Its Work: W-59.

Note: The climate of any part of the Earth depends, as you can now see, upon two factors—the unchanging factor of season and zone and the variable factor of the atmosphere and its phenomena.

III. HYDROSPHERE OR WATER:

- A. Nature and Functions of the Earth's Waters: W-42-6.
 - a. The Importance of Water to All Life: B-112, P-238.
 - b. Chemistry of Water: W-46.
 - c. Behavior of Water When Freezing or Melting: H-260, I-2.
- B. Water Formations:
 - a. Oceans: O-195.
 - b. Lakes: L-55.
 - c. Rivers: R-109.
 - d. Springs: S-263.
 - e. Water Beneath the Surface: A-311, S-263.

Note: All the water formations except oceans will be studied in detail in the next section. The intimate association between lakes, rivers, etc., and the surface features of the land makes it advisable to consider them in that connection rather than to give them separate treatment here.

- C. Oceans: O-195.
 - a. The Ocean Beds:
 1. Origin of the Ocean Beds P-198.
 2. Character of the Ocean Beds G-44 picture.
 3. Geologic Changes in Sea Level G-42.
 4. Ocean Depths A-63, P-1.
 - Exploring Ocean Depths O-198, D-72, P-180, E-345.
 - b. Movements of Ocean Waters:
 1. Nature of Waves W-57-8.
 2. Ocean Currents and Their Work O-200, G-185, A-102.
 3. Tides T-90-2.
 - c. Effect of Oceans on Climate: C-270, O-200, W-42.
 - d. Life in the Oceans: B-114, O-198, O-197 and O-199 pictures.
 1. Corals and Their Work C-362.
 2. Phosphorescence P-176.
 - e. The Five Oceans:
 1. Pacific Ocean P-1.
 2. Atlantic Ocean A-358.
 3. Indian Ocean I-51.
 4. Antarctic Ocean (Fact-Index).
 5. Arctic Ocean A-277.
 - f. Branches of Oceans Called Seas: Mediterranean M-109; Black Sea B-154; Red Sea R-62; North Sea N-170; Baltic B-32; Caribbean C-84; Bering B-97.

IV. LITHOSPHERE OR ROCK AND SOIL:

- A. Rock Formations of the Earth: G-39.
 - a. Igneous or Unstratified Rock: G-39.
 - Lava L-73-4; Granite G-131; Basalt (Fingal's Cave) S-46 picture, (Giant's Causeway) I-125 picture; Quartz Q-3; Feldspar F-22; Obsidian, Porphyry, Pumice L-74.

b. Sedimentary or Stratified Rock: G-39.

1. Rock Sediments: Sandstone S-23; Clay C-259-61, S-158; Mudstone, Shale S-158.
2. Animal and Plant Sediments: Limestone, Dolomite L-138; Chalk C-137; Coal C-283; Peat P-98; Asphalt A-336.
3. Chemical Sediments: Gypsum G-190; Salt S-15.
- c. Metamorphic Rock: G-39.
 - Marble M-60-1; Flint F-106; Slate S-158; Mica M-145.

B. The Formation of Soil: S-190.

Note: We have seen that the sedimentary rocks were formed for the most part from the disintegrated igneous rocks and from the remains of animals and plants. The same forces of weather and decay which produced those ancient sediments are busy producing the soil which covers the Earth today. And today's soil is on the same road as that silt of bygone ages. The rains wash it away to the rivers and the rivers carry it to the sea, where it is deposited in vast layers one upon the other. In the course of time it will turn into rock again. Thus the rocks and the life of today are the soil of tomorrow, and the soil of today is the rock of tomorrow—if you count your todays and tomorrows as millions of years long. In the picture on page G-43 you will find explained a special form of this everlasting cycle of change.

- a. Chief Forces in Soil Production: Sun and Rain, Streams and Ocean Waves, Winds, Frosts, Past and Present Work of the Glaciers, Decay and the Work of Bacteria S-191, W-112, G-96, I-2-3, N-152, B-12.
- b. Principal Kinds of Soil:
 1. Residual Soils:
 - Sand S-21; Clay Soils from Shale S-191; Limestone Soils L-138.
 2. Transported Soils—Consisting Chiefly of "Alluvial" Soils, "Aeolian," "Drift," and "Ash" Soils S-191.
 - Humus and Loam S-191; Loess S-191, W-112; Drift N-152, G-96, I-3.
- c. Chief Minerals and Their Composition: M-181.

Features of the Earth's Surface and Their Origin

I. LAND FORMATIONS AND INLAND WATERS:

- A. Continents:
 - a. Origin of Continents: P-198, N-152.
 1. How Fossils Prove That Continents Came Out of the Sea F-162, N-152, S-357.
 2. Ancient History of Continents:
 - (a) Ice Age I-2, G-96, N-152.
 - (b) The North Sea as an Example of How Parts of Ancient Continents Have Been Submerged N-170.
 - b. Continental Shelves: P-198, O-200.
 - c. Irregularities of Continental Outlines and Their Origin:
 - Peninsulas, Capes, Gulfs, and Bays P-198.
 - d. Comparative Size of the Continents: P-201 picture.
 - e. "Continental" as Opposed to "Oceanic" Climate: C-270-1.
- B. Mountains: M-291.
 - a. Origin of Mountains: M-292, P-200.
 - "Old" and "Young" Mountains P-199 picture, A-230 picture.
 - b. Effect of Mountains on Climate: C-271, B-246-7, P-200.
 - Effect Upon Rainfall R-47, I-33.
 - c. Effect of Mountains on Human Life: M-292, P-200.
 - How Mountains Play a Part in History N-151, E-321, S-228.
 - d. Mountains as Sources of Minerals: M-188, A-195.
 - e. Important Mountain Ranges:
 1. Himalaya H-291.
 2. Andes A-194.

3. Alps A-135, S-355-7 pictures.
 4. Ural Mountains U-260.
 5. Pyrenees P-372, S-226-7.
 6. Sierra Nevada S-141.
 7. Rocky Mountains R-123, C-48-50 pictures, C-313 picture.
- C. Rivers: R-109.**
- a. Origin of Rivers: R-109-10.
—Springs S-263.
 - b. The Work of Rivers: R-109.
 1. Cutting Valleys and Transporting Soil P-201, V-269.
 2. Forming Alluvial Land P-201, M-204, S-191.
 3. Deltas and Their Origin P-201, R-110.
 - c. Effect of Rivers on Human Life: R-109.
 1. Value of Rivers for Transportation T-121, T-122, T-125.
 2. Their Value for Irrigation I-148-50.
 3. Their Value for Water Power W-49.
 - d. Some Important River Systems:
 1. Mississippi-Missouri M-203, M-211.
 2. Amazon A-139 picture.
 3. Nile N-145.
 4. Congo C-330.
 5. Yangtze Y-203.
 6. Hwang H-364.
 7. Niger N-143.
 8. Mackenzie M-12.
 9. Volga V-334.
 10. Yukon Y-214.
 11. Orinoco O-250.
 12. Plata-Parana-Uruguay P-246.
 13. Danube D-13.
 14. Ganges G-5.
- D. Valleys: V-269.**
- a. Origin of Valleys: P-201, V-269.
—Canyons C-79, G-129, G-130 picture.
 - b. "Old" and "Young" Valleys: P-199 picture, P-201, V-269.
- Note:** Since valleys are, of course, always associated with mountains or rivers, the preceding sections will have brought out already the chief points for study.
- E. Lakes: L-55.**
- a. Origin of Lakes: L-55, I-3.
—Formed in Closed Land Basins P-201.
 - b. Influence of Lakes on Human Life:
 1. Ancient Lake Dwellers L-55.
 2. Influence of Lakes on Climate G-146, N-151.
 3. Lake Transportation (Great Lakes) G-146-50.
 - c. Salt Lakes: G-151, P-34.
 - d. Some Important Lakes and Inland Seas:
 1. Caspian C-91.
 2. Aral A-246.
 3. Great Lakes G-146.
 4. Lake Victoria V-297.
 5. Lake Tanganyika T-8.
 6. Lake Geneva G-30, G-29 picture.
- F. Plains and Plateaus: P-198, P-200.**
- a. Origin of Plains and Plateaus: P-200.
 - b. Influence on Human Life:
—Concentration of Population on Plains P-200.
 - c. Various Kinds of Plains: A-330. Tundras A-325, E-319, R-180, R-179 picture, N-151; Steppes R-180; Savannas A-36; Pampas A-278, A-279, S-205.
 - d. Laurentian Plateau as an Illustration of Plateau Features: L-72.
- G. Deserts:**
- a. The Sahara as an Example of the Origin of Deserts: S-4.
 - b. Characteristics of Other Great Deserts: A-328, T-157, A-368, A-237.
- H. Islands:**
- a. Origin of Islands: P-198.
 1. Volcanic Islands V-332, P-5.
 2. Coral Islands (Atolls) C-364, P-5.
 - b. The World's Largest Islands:
 1. Greenland G-175-6 map.
 2. New Guinea N-83.
 3. Borneo B-196.
 4. Madagascar M-17.
 5. Sumatra S-325.
 6. Great Britain G-144.
- II. OTHER FEATURES OF THE EARTH'S SURFACE:**
- A. Volcanoes—Their Origin and Behavior: V-331.** Principal Volcanoes of the World—Mount Vesuvius V-291-2; Mont Pelée M-72; Mount Popocatepetl M-133, M-136 picture; Kilauea and Mauna Loa H-242.
- B. Earthquakes: E-135.** Major Earthquakes in Recent Years—San Francisco S-24, E-136; Messina S-140, E-135 picture; Guatemala G-182; Japan T-104.
- C. Geysers: G-82.** Great Geysers of the World—The Giant and Old Faithful Y-205, G-83 picture; Constant N-17 picture; New Zealand N-135.
- D. Caves: C-116.** Some Notable Caves—Mammoth Cave C-117 picture; Carlsbad Cavern N-21-2 picture; Fingal's Cave S-46 picture.
- III. THE POINTS OF THE COMPASS: C-326.**
- A. Geographic and Magnetic Poles: C-326, E-132.**
- B. How the Compass Determines Directions: C-325.**
- IV. LATITUDE AND LONGITUDE: L-70.**
- A. Parallels of Latitude and What They Mean: L-70.**
- B. Meridians of Longitude and What They Mean: L-70, L-195.**
- C. How the Latitude and Longitude of a Place Is Determined: N-46-7.**
- V. MAPS AND MAP MAKING: M-58-9.**
- A. Map Projections and Difficulties of Map Making: M-58-9.**
- B. Geodetic Surveys, the Basis for Accurate Maps: S-331.**
- ### Exploration and the Spread of Civilization
- I. ANCIENT:**
- The oldest known ships, the principal vehicle of explorers, are shown on a pre-Egyptian vase of 6000-5000 B.C. 3000-2000 B.C. Egyptian culture spreads through contact with Cretans; people of Crete become highly civilized and dominate the Aegean Sea: A-26, G-156. 1500-1200 B.C. Cretan traders spread culture to other Mediterranean countries: A-27. 1000-800 B.C. Carthage, founded by Phoenicians from Tyre, becomes the starting point for many explorers and colonists: C-88, F-171, P-173, G-34. 800-594 B.C. The Phoenicians explore Atlantic coast of Europe on voyages to the Tin Islands (British Isles): E-269. Their explorations and trading among the Greeks gave the latter their alphabet: A-135. Necho, King of Egypt, sends Ithobal of Tyre and a Phoenician crew on a voyage around Africa: A-38. 600-400 B.C. Greeks become colonizers; Anaximander, the philosopher, evolves a system of map making. Greek traders found Massalia (modern Marseilles): F-171. Hecataeus writes the first geography. Herodotus describes known lands as result of his travels: G-34. Xenophon's expedition across Asia Minor: X-197. 400-300 B.C. Pytheas explores northeastern Atlantic: G-34. Alexander the Great enters India: A-115, G-34. 240-196 B.C. Eratosthenes writes a geography: G-34, E-130, A-142. 60-54 B.C. Julius Caesar combines conquest and exploration on his expeditions to France, Germany, and Britain: C-12, F-171, G-34, G-71. 0-20 A.D. Strabo writes a geography: G-174. 83 A.D. Agricola discovers the Scottish Highlands. 159 A.D. Ptolemy writes a geography and draws maps of the known world: G-34, P-363. 432-491 A.D. Ireland explored by St. Patrick: P-87.

II. MEDIEVAL:

861. Iceland discovered by Naddod the Viking.
 874. Norse colonize Iceland: I-6.
 985. Eric the Red colonizes Greenland: G-176, N-168.
 1000. Leif Ericson discovers North America: N-168, A-141, A-142 picture.
 1096-1291. The Crusades bring Europe into contact with Asiatic culture: C-406.
 1260-71. The brothers Maffeo and Nicolo Polo journey to China: P-298.
 1271-95. Marco Polo's travels and explorations: P-298, G-34, A-141.

III. MODERN:

1418. Prince Henry of Portugal (Henry the Navigator) starts new era of exploration: H-280, A-38, P-314, C-316.
 1488. Bartholomew Diaz is first European navigator to round the Cape of Good Hope: C-80, S-199.
 1492. Christopher Columbus sails west and discovers the West Indies: C-316, A-142.
 1497. The Cabots reach the north coast of North America: C-9, C-58, A-144.
 1497-98. Vasco da Gama makes passage to India by the Cape of Good Hope: G-3, A-142, P-7.
 1498. Columbus discovers the mainland of South America: S-208L.
 1499. Americus Vesputius discovers Trinidad and Venezuela: A-143.
 1500. Vicente Pinzon, Spanish explorer, discovers Brazil: B-227, A-143 map.
 1500. Pedro Cabral, on voyage to India, claims Brazil for Portugal: A-142, A-143 map, B-227.
 1502. Columbus discovers Central America: C-133c, H-330.
 1513. Balboa crosses the Isthmus of Panama and discovers the Pacific Ocean: A-143, B-15-16, P-1 picture, P-7, P-228.
 1519. Cortez conquers and explores Mexico: C-372, A-144.
 1519-22. Magellan's expedition makes first circumnavigation of the world: A-144, M-27-8, P-7. Discovers Patagonia in 1520 (P-84), Guam in 1521 (G-181).
 1531. Pizarro conquers and explores Peru: P-227a, 228, P-140.
 1534. The Gulf of St. Lawrence discovered by Jacques Cartier: C-89, Q-7, S-8, A-145.
 1542. Cabrillo explores the California coast: C-32.
 1576. Martin Frobisher explores the Arctic: P-280.
 1577-80. Drake explores Pacific coast, and circumnavigates the earth: D-90, A-143 map, M-27 map, B-247, C-32.
 1587. Davis Strait discovered: P-280, N-150-1 map.
 1595. Raleigh explores Guiana and Orinoco: R-49, 50, O-250.
 1606. Luis de Torres gives his name to strait between Australia and New Guinea: A-372.
 1610. Hudson discovers the bay named after him: H-348, P-280, C-58 map.
 1615. Lake Huron is discovered by Champlain, who from 1608 to 1616 explored the St. Lawrence River system: C-138-9, G-150a, C-59, C-64 picture.
 1615. Baffin discovers Baffin Bay: A-277 map, P-280, C-58 map.
 1642. Abel Tasman discovers New Zealand and Tasmania: T-14, N-136, A-372, P-7.
 1648. Deshnef discovers sea and strait later named for Bering: B-97.
 1725-41. Bering (Behring) explores the sea and strait now named after him: B-97, P-280, A-105 picture-map.
 1769. Captain James Cook explores New Zealand: C-347d, N-136.
 1770. Cook explores Australian coast, planting English flag on Cape York: A-372, A-373, C-347d, C-348.
 1772-75. Cook makes voyage of exploration to Antarctic Ocean: C-348, P-283.
 1778. Cook rediscovers the Hawaiian Islands: H-245, C-348.
 1789-93. Mackenzie explores the Mackenzie River and is the first white man to cross Canada to the Pacific: M-12, C-59, C-65, C-50-1 map.
 1792. Vancouver explores Vancouver Island: V-271.

- 1830-31. John Ross discovers and names Boothia Felix (Boothia Peninsula) and James Ross, his nephew, discovers the Magnetic Pole: P-280, A-217.
 1838-42. Charles Wilkes, American naval officer, explores Antarctic: P-283.
 1840-43. James Ross discovers Ross Sea and South Victoria Land in the Antarctic: P-283.
 1847. Franklin searches for the Northwest Passage but perishes on the voyage: P-280.
 1849-56. Livingstone makes important discoveries in Africa: L-167, L-169, A-40, C-331, L-167-8 pictures.
 1858. Burton and Speke discover Lake Tanganyika: T-8.
 1858-64. Livingstone finds Lake Nyasa: L-169.
 1868. Livingstone discovers Lake Bangweulu: L-169.
 1877. Stanley explores the Congo and finds its mouth: S-270-1, A-40, C-331.

IV. RECENT EXPLORATIONS:

1895. Nansen arrives at a point farthest north: P-282, A-277 map.
 1902. Scott explores land in Antarctic: P-283.
 1904. Younghusband and the first white man to enter Lhasa, the sacred city of Tibet: T-90.
 1909. Peary discovers the North Pole: P-97, P-282, P-98 picture, A-277 map.
 1911. Amundsen finds the South Pole: A-190, P-283, A-190 map.
 1912. Scott reaches South Pole: P-283, S-47.
 1928-30, 1933-35. Byrd explores Antarctica and flies over the South Pole: B-289, P-286.
 1931. Dickey discovers the source of the Orinoco: O-250.

V. OTHER MODERN EXPLORATION: E-343.

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The WONDROUS STORY We READ in the ROCKS

A Young Science that Peers Deep into the Abysses of the Ages—The Biography of Mother Earth and How to Read It in the Landscape and in the Ground beneath Your Feet

GEOLOGY. Geology is the science which deals with the history of the earth. It is the task of geology not simply to recite the history of the earth so far as it is known, but to show how this history became known and how the limits of knowledge are being extended. Geology is a young science, and in its study at the present time it is needful to take account of the limitations of present knowledge as well as of the knowledge itself.

Everything which throws light on the history of the earth falls within the field of geology. The history of the atmosphere and the history of the ocean are really parts of geology, since the atmosphere and the ocean are parts of the earth. The popular impression, therefore, that geology has to do only with the rocks of the earth is not altogether adequate. The rocks of the earth, to be sure, furnish the larger part of the data for unraveling the history of the earth, though they are not the only sources of information. It is to be remembered, too, that when the geologist studies the rocks, he studies them for the light they can be made to throw on earth-history, rather than for their own sake.

How Earth Rehearses the Story of Her Life

In working out the history of the earth, so far as it has been worked out, the line of approach has been through the study of the changes which are now taking place on the earth's surface. The rain falls on the land, and some of it gathers into streams, and the streams flow into the sea. In the flow of the water the substance of the land is worn away. The material is carried to the sea and deposited there in the form of gravel, sand, mud, etc. The sand and mud need nothing but cementation to become sandstone and shale, two of the commonest sorts of rocks found on the land. The process of cementation is now going on by natural means in many places. In the sand and the mud, as they are deposited in the sea, shells of various animals are imbedded. The shale and sandstone of the land also contain shells and other traces of marine animals known as fossils (*see Fossils*). Hence it is inferred that the sandstone and shale, as well as certain other sorts of rock found in the land, originally were deposited as beds of sand and mud in the sea, and that they have since been elevated so as to become dry land.

The activities of other surface agencies are studied similarly. The detailed study of the work now being done by rain and rivers, underground water, waves and currents, the atmosphere, glaciers, changes of temperature, gravity, organic agencies, and all other forces and activities operative on the surface of the earth, has taught geologists how to interpret the rocks formed in ages long past. It is by the interpretation

of the recorded results of the past, in the light of the processes now taking place, that the science of geology has grown up. The study of present processes is becoming more and more exhaustive, and the application of this increased knowledge of present processes to the records of the past is continually enlarging and perfecting our knowledge of the earth's history.

The Mystery in the World's Beginnings

Geology really begins with the origin of the earth, and at this point it touches the field of astronomy. The early ages of the earth's history are as yet speculative. There seems to be good reason for doubting the truth of the "nebular hypothesis," which was long regarded as satisfactory. The only rival hypothesis which has been framed is the "planetesimal hypothesis," which supposes that the earth is made up of an aggregation of small bodies comparable to the meteorites and shooting stars which daily reach the earth by millions at the present time. (*See Meteors and Meteorites.*) While the stages of the earth's history preceding the beginning of sedimentation are largely conjectural, many lines of investigation are being pursued which ultimately may throw much light on the early and obscure stages of the earth's development. The general outlines of this history since sedimentation began are fairly well understood.

The rocks of the earth which contain the principal records of the earth's history are of three great classes: (1) igneous rocks, or those which represent solidified lava; (2) sedimentary rocks, as shale, sandstone, conglomerate, etc., most of which are made up of fragments of older rocks; and (3) metamorphic rocks, which may have been so far altered by various means that they are now very unlike the materials from which they were first made. In the metamorphism of rocks, pressure is the most important agent. Chemical change, under the influence of moisture, is probably second in importance; and heat third. A special class of sedimentary rocks is due to life. Here belong most limestones, made of shells, corals, etc.; coal, of plant origin; and a number of lesser formations.

The composition, position, and structure of these several sorts of rock and their fossil contents, so far as they contain fossils, interpreted in the light of processes now taking place, allow geologists to infer the conditions under which the various sorts of rocks are made. When geologists are able to tell what the conditions were on every part of the earth at every period of the past, the science of geology will be complete.

Among the many branches of the science, economic geology is one of the most important. It deals with the materials of the earth's crust which are commercially valuable, and has to do with ores of all sorts, with coal, with building stone, with clays which are

valuable for the manufacture of brick and pottery, and the like. It deals also with materials which can be used for pigments; sand, used for making glass; with precious stones; with abrasive materials; with asphaltum, petroleum, natural gas, salt, fertilizers, etc. One function of economic geology is to determine the origin of these substances and, so far as possible, the laws which govern their distribution.

Five Vast Chapters in Earth's Story

Geologic time is divided into five eras, and most of these are divided into several periods, as shown in the following table reading from the present to the remote past:

ERAS	PERIODS
CENOZOIC.....	Quaternary (including glacial)
	Pliocene
	Miocene
	Oligocene
	Eocene
MESOZOIC.....	Upper Cretaceous
	Lower Cretaceous
	Jurassic
	Triassic
PALEOZOIC.....	Permian
	Pennsylvanian
	Mississippian
	Devonian
	Silurian (=Upper Silurian)
	Ordovician (=Lower Silurian)
PROTEROZOIC.....	Algonkian
ARCHEOZOIC.....	Archean

The Archeozoic era was the time occupied in the making of the oldest known system of rocks. The Archean rocks are mostly metamorphosed igneous rocks, though with them are some metamorphic sedimentary rocks. Fossil algae have been found in this system of rocks, and it is certain that life existed before the close of this era.

The Proterozoic era is the time during which were deposited the great systems of rocks lying above the Archeozoic and below the oldest rocks containing abundant fossils. The rocks of the Proterozoic era are mainly sedimentary, though igneous rocks have great development locally. The formations of the Proterozoic era are many thousands of feet thick, though considerable portions have been removed by erosion. The Proterozoic era was perhaps as long as all subsequent time. Some forms of life existed during this era, as is shown by the few fossils which have been found in the rocks, and by the nature of some of the formations, even where fossils are wanting. For example, there are black shales and graphitic slates, the carbon of which probably is of plant origin. The Proterozoic (Algonkian) rocks of the Lake Superior region contain rich deposits of iron and copper.

The Paleozoic (formerly called Primary) era was the time when the several systems of rocks bearing the names Cambrian, Ordovician, Silurian, Devonian, Mississippian and Pennsylvanian (Carboniferous), and Permian were deposited. The time occupied in the deposition of each of these systems is a period.

These systems of rocks are mainly of sedimentary origin, and the materials of which they are composed were derived from the land areas existing when these systems were being laid down. Most of the materials of the systems were washed down from the land to the sea, and there deposited. The several systems of Paleozoic rocks are distinguished from one another by their fossils. Thus, the fossils of the Cambrian system of rocks are sufficiently unlike those of the Ordovician system to be readily distinguished by those familiar with fossils.

Relics of the Pioneers in the Field of Life

Even at the beginning of the Cambrian period the range of life was great, all the great types which now live except the vertebrates being represented. Even the vertebrates may have lived, though relics of their existence have not been found. In this period trilobites and brachiopods seem to have been the most abundant and characteristic life. In the rocks of the Ordovician system fish remains have been found, and also relics of air-breathing life. Mollusks, crinoids, and corals lived in great profusion, in addition to the types of life which predominated in the Cambrian period. Most of the oil and gas of Ohio and Indiana has come from rocks of the Ordovician age.

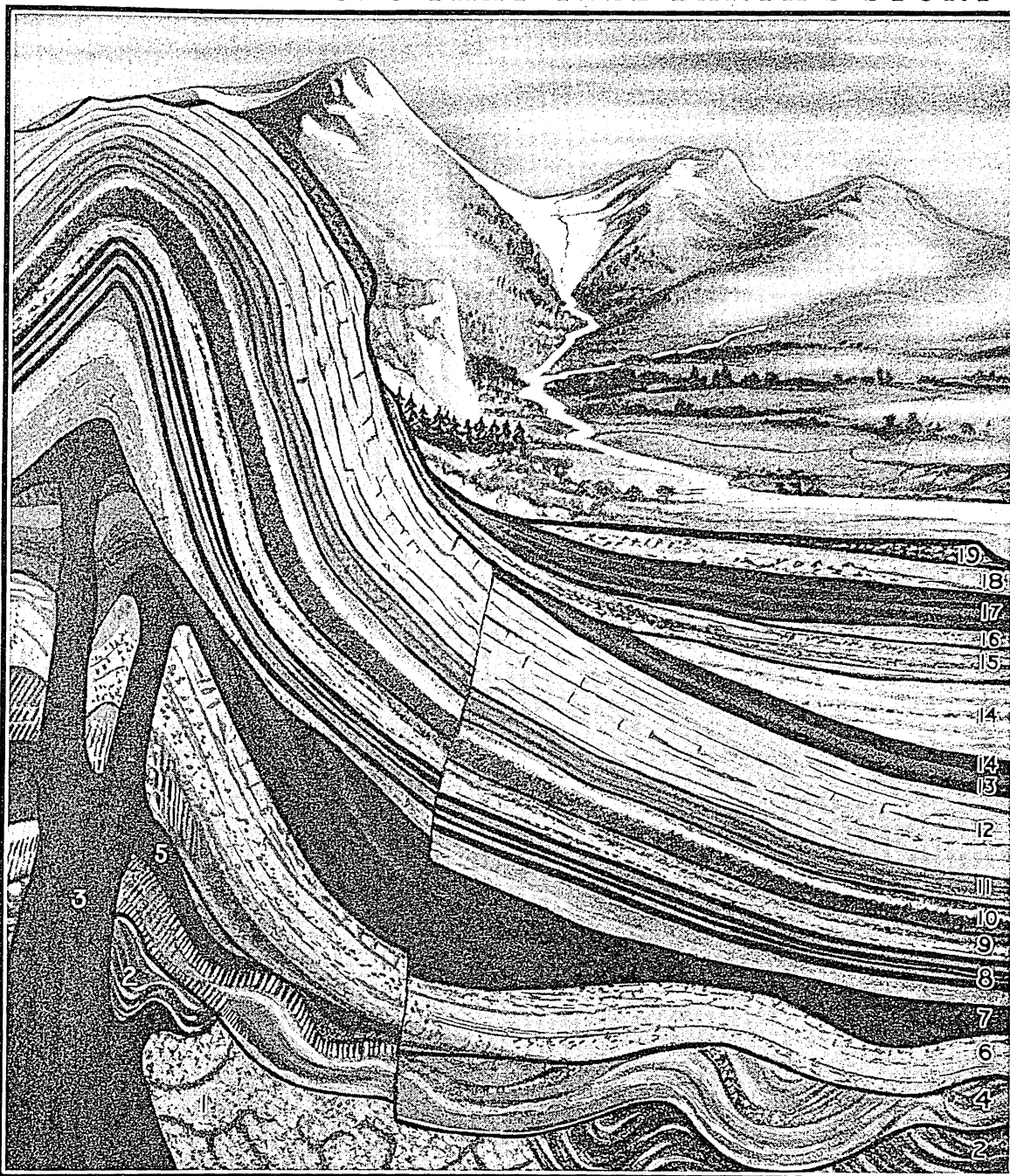
In the Silurian period the same general types of life were prevalent, but the species are so unlike those of the preceding period as to be readily distinguished by those familiar with fossils. The Devonian period is often known as the Age of Fishes, on account of the abundance of fish remains in the rocks of this system. It is far from certain, however, that fish were more abundant than now, and the variety of fish probably was less than at the present time. The Devonian was, however, the first period when fishes were abundant, so far as now known. The oil of Pennsylvania and Canada is largely derived from beds of Devonian age.

When Mother Earth Put in Our Winter Coal

During the Mississippian period, animal life seems to have become notably more abundant, and some beds of coal were formed, though coal is more characteristic of the next system. Much oil has been derived from the Mississippian system of rocks in Illinois. During the Pennsylvanian period there were extensive marshes in the United States and in some other parts of the world, in which vegetable matter accumulated in great quantity. These marshes (peat-bogs) subsequently were submerged, and the vegetable matter buried by mud, sand, etc., and ultimately converted into coal. Most of the coal of the United States east of the Great Plains was accumulated at this period. Plant life was abundant, but the plants were largely of types now extinct. Land animals of early reptilian types were common. The Mississippian, Pennsylvanian and Permian periods sometimes are called the Carboniferous period.

The Permian period represents a transition stage between the Paleozoic and the Mesozoic eras. In the Permian period there was extensive glaciation in Australia, South Africa, India, and South America.

THE STONE PAGES THAT TELL EARTH'S STORY



This picture illustrates how the old, old story of the Earth was written, so to speak, in the successive layers of stone laid down age after age and how geologists have been able to read it owing to the fact that the strata or "pages" are exposed by being wrinkled up into mountains and worn away by wind and weather and flowing streams. The great vertical crack running down the center of the picture is what is known as a "fault." The sudden development of such a break and the sinking of the rocks on one side is one of the causes of earthquakes, especially in mountain regions. In reading the stone book, you must start, not at the top, but at the bottom—the order in which the layers were formed. The oldest rock formation (1) consisting of gneiss, granite, and schist, is called Archean, meaning "ancient" and the era in which it was made is known as Archeozoic, meaning "ancient life." The next (2) is called Algonkian, formed in the Proterozoic era. The black vertical formation (3) is not one of the regular strata, but "trap rock" formed by molten stone which has welled up and broken through the layers above. The others in their order are Cambrian (4), Ordovician (5), Silurian (6), Devonian (7), Carboniferous or "coal-bearing" (8), which includes also Permian (9); then come Triassic (10), Jurassic, including Liassic (11), and Oolitic (12); Lower Cretaceous (13), and Upper Cretaceous (14); Eocene (15), which marks the beginning of the "Age of Mammals"; Oligocene (16), when the forerunners of the most of the present-day mammals began to take shape; Miocene (17), when such creatures as the mastodon appeared; Pliocene (18), which probably marks the beginning of the "Age of Man." The rock systems of the Quaternary period are the Pleistocene (19), formed about the time when man was struggling against the cave-bear and the mastodon, and the uppermost layer of comparatively modern origin, called the Holocene or "Recent." These rocks differ from each other in chemical composition, the character of fossils they contain, and in various other ways; but when you remember that countless ages of earthquakes, upheavals, and subsidences have mixed them together, you will appreciate what a task it has been to read their lesson correctly.

The several systems of Paleozoic rocks have somewhat different distribution, and, since the area of the deposits of any period corresponds approximately with the submerged area of that period, the distribution of the several systems helps us to understand the relations of land and water during the several periods. In this way it is known that the relations of sea and land were different at different times. It would appear either that the continent repeatedly rose and sank, causing areas which were at one time submerged to become land, and vice versa; or that the sea-level itself rose and fell. If the sea-level rose, it would overspread the low lands; if it were lowered, it would cause areas which had been submerged to become land. How far the many changes in geography during the Paleozoic era were the result of land oscillations, and how far they were the result of oscillations of sea-level, never has been determined. So far as present knowledge goes, it would appear that the deep-sea bottom has at no time been land, and that the areas which were alternately above and below sea-level were low when they were land, and covered by shallow water only when they were submerged.

When Giant Reptiles Ruled the Land

The Mesozoic (formerly called Secondary) era, as the term indicates, was the era when life intermediate between the ancient and the present existed. This era is divided into several periods, as indicated above. The Triassic formations of North America are somewhat widespread in the western third of the continent, but have but little development in the eastern part. During this period reptiles perhaps were the dominant type of life. They were not only numerous but the individuals attained great size (*see Animals, Prehistoric*). The earliest known remains of mammals date from this period. Marine life abounded, but departed notably from the types which had prevailed in the Paleozoic era. Vegetation was abundant, but of types now extinct or rare.

The Jurassic period followed, and the distribution of its formations is similar to that of the Triassic formations. The life of this period was somewhat different from that of the preceding, though the same general types abounded. Reptiles were the most distinctive type, and they were even larger than in the preceding period. The oldest remains of birds yet found are Jurassic.

The Jurassic period was followed by the Cretaceous (Chalk) periods. In the early part of the first period chalk was not being deposited, but in the later part chalk deposits were in process of formation in many parts of the earth. The chalk deposits are made up, for the most part, of the shells of minute marine animals (*see Chalk*). The Cretaceous formations of North America are much more widespread than those of the Jurassic and Triassic periods. Their distribution indicates that a large part of the North American continent was submerged during part of the later Cretaceous periods. It was during the Upper Cretaceous that modern types of plants and fishes

made their appearance. During the last stages of the Cretaceous periods extensive coal beds were laid down in the western United States.

Exit the Monsters; Enter the Mammals

The Cenozoic era, or era of modern life, followed the Mesozoic. Mammals, the earliest remains of which were found in the rocks of the Triassic system, abounded during the Cenozoic era, while the huge reptiles which had been especially characteristic of the Mesozoic era had disappeared. Reptiles still existed, but they were of relatively small types, and their numbers appear to have been few. As the Cenozoic era progressed, the forms of life approached more and more closely to those of the present time, and by the end of the Pliocene the life was nearly the same as that which now exists.

One theory ascribes this change from Mesozoic to Cenozoic life to a change in climate and ground surface. Before the change much of the ground was marshy, and since under such conditions size and power were more important than speed for survival, ponderous reptile forms dominated the earth. Then geologic changes drained off the water, created large areas of hard ground surface suited to running, and supplanted the luxurious swampy vegetation with modern "dry land" flowering plants. These changes gave the running types of animal, with their speed and ability to range far in search of food, an advantage over the clumsy giant reptiles, which therefore gradually became extinct.

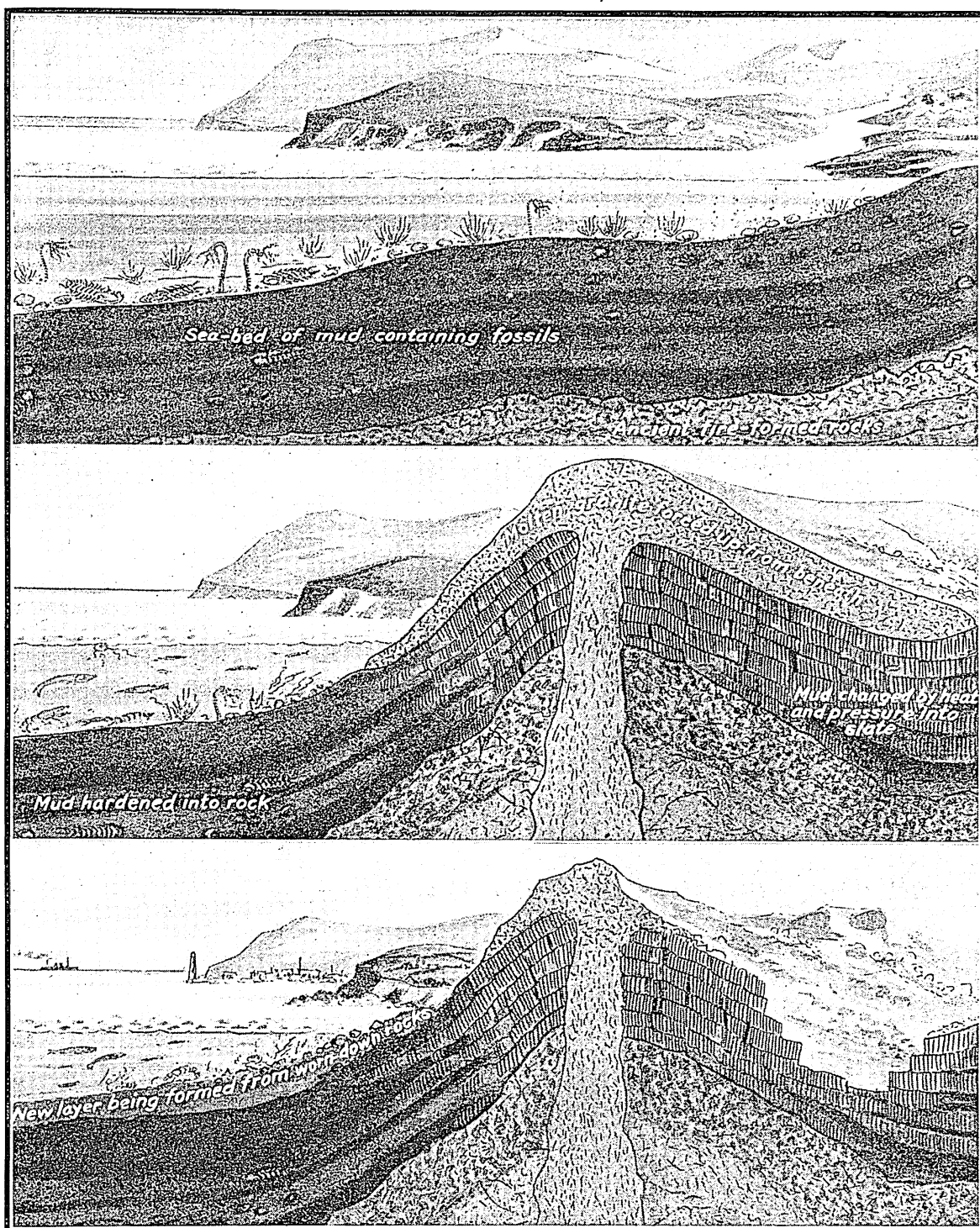
The Quaternary period was marked by widespread glacial conditions. A series of ice sheets covered something like four million square miles in North America. Similar ice sheets covered much of Europe (*see Ice Age*). At length the ice sheets receded toward the north, and the present climate was established. Because of this change, the Quaternary is often divided into the Pleistocene (glacial phase) and the Holocene (modern phase).

The duration of the earth's history is a matter which has received much attention, but no conclusions have been reached which can be relied upon, beyond the very general one that the history of the earth has been exceedingly long (*see Earth*). Various conjectures as to the number of years occupied in bringing the earth to its present condition have been made. They range from 25,000,000 years or so to 1,500,000,000 since the time of the formation of the oldest rocks now accessible. As stated above the Archeozoic era probably was longer than all subsequent time put together. The Proterozoic era was perhaps as long as all that followed. The Paleozoic era was perhaps two or three times as long as the Mesozoic, and the Mesozoic probably was considerably longer than the Cenozoic.

Great Changes in Climate

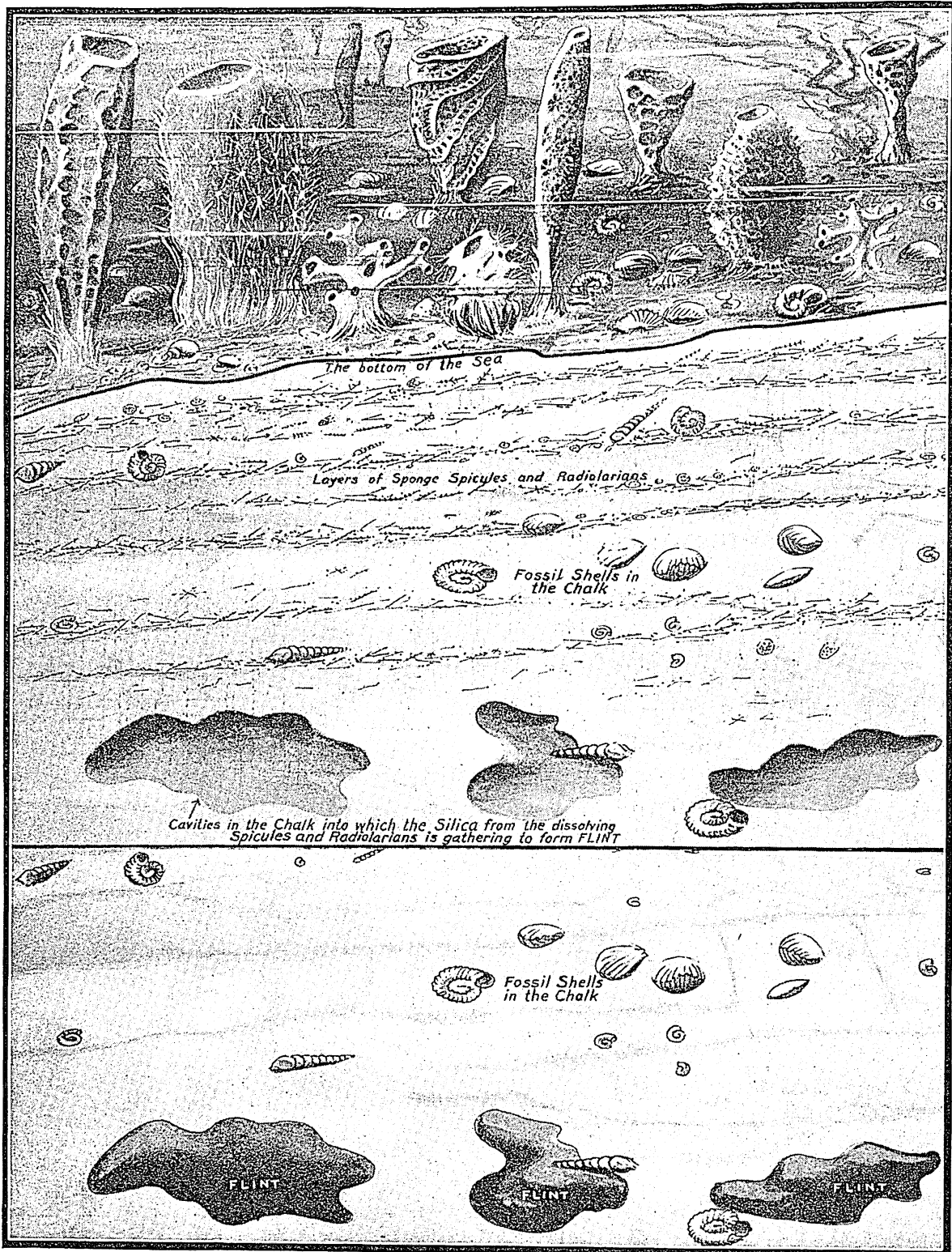
The climatic changes which the earth has undergone have been great, but their causes are not well understood. There is little basis for the belief, formerly widespread, that the climate has on the whole been growing cooler. Cold periods seem to have alternated

HOW MUD IS TURNED TO ROCK, AND ROCK TO MUD



This series of pictures illustrates the processes by which certain kinds of rock are made. In the first picture we see a bed of mud beneath the sea containing fossils and overlying the ancient fire-formed rocks. Ages later, perhaps, an immense fold of the earth's crust split and masses of molten rock welled up from below, flowing out over the surface. The heat and pressure of this molten mass turned the mud rock into slate. Then, thousands and thousands of years later, part of the granite was worn away by the flowing waters of a river, leaving the slate exposed. On the other side of the cliff you see the sea grinding more rock into mud, which may perhaps in the course of the ages be buried beneath another eruption of molten rock and harden into a new layer of slate. And so the Old Earth goes on changing its skin, shifting its waters, and working over its raw materials. The process may seem slow to us, but Nature has "all the time in the world" to do her work. Indeed, when you think that all recorded history only reaches back some 6,000 years, and that a million years, or more than a hundred times the span of all human history, is only a small period in geologic time, you can see how deliberately Nature proceeds about her tasks.

HOW THE SEA MAKES ANIMALS INTO FLINT



Did you know that the great factory of the sea actually makes the skeletons of sponges and other tiny animals (the "radiolarians") into masses of flint? The process is long but quite simple. The bodies of these animals fall to the ocean bottom. There they are buried under layers of chalk formed by the shells of other ocean creatures. In the course of time, cavities come in the chalk beds and the stony material (silica) left by the decay of the "spicules" composing the skeletons of the sponges and radiolarians seeps into these holes. Here it hardens and becomes flint. Sometimes these little bodies fossilize instead of dissolving, and it is by finding these fossils, both in the chalk and in the flint, that scientists have been able to learn the entire process.

with warmer ones. There was local glaciation in the Paleozoic era, and extensive glaciation at the close of the Paleozoic. There was glaciation in the early Cenozoic era and very extensive glaciation later in that era; and there is some indication of cold periods at other times. On the other hand the lands of high latitudes enjoyed genial climates during some parts of the earth's history, even as late as the mid-Tertiary time.

Volcanic activity seems to have been greater at some periods than at others, but on the whole it seems to have been about as great, so far as now known, in late as in early stages of the earth's history, if the Archeozoic era be excepted.

The Work and Training of a Geologist

Although geology is among the youngest of the sciences it is also one of the most useful. Much that is useful to mankind comes out of the earth. Fuel for warmth and power, stone, clay, and cement for our houses, metals for making the machines that serve the modern industrial world—all these are earth products.

These various useful commodities are not placed within the earth like plums in a pudding without law or order. Each deposit of every one of them is where it is for some good geological reason. The study of the origin, distribution, and laws of occurrence of such deposits is part of the science of geology.

Geology has a particularly strong appeal to the man who has a love for the great outdoors, "the glory of the sun and streams that murmur as they run." The earth itself is the great textbook of geology, open everywhere to the one who is willing and knows how to read its lesson. To become expert in his science the geologist must travel widely and often to difficult and dangerous places. He should be proficient in all manners of travel—afloat, with a pack-sack, on horseback, in the canoe, and by wagon—and able to camp in forests, on the plains, or in the mountains.

Since geology is largely the application of other sciences to earth problems, the geologist must have at least an elementary knowledge of chemistry, physics, and mathematics. His work is largely the study of minerals, rocks, and ores and their relations to one another, and particularly the relations of groups of rocks or rock formations to each other, and the relations of mineral deposits to the various rock masses in which they are found. Since a large part of his business is the making of maps, he should know surveying and drafting.

How Geologists are Employed

There are four kinds of activities in which most geologists find employment. These are:

1. Work on the faculties of colleges, universities, and technical schools.
2. Work on the state and national geological surveys, and in other research organizations.
3. Work on geological staffs of mining companies.
4. Work on staffs of oil and gas companies.

All of the larger universities and technical schools and most of the colleges maintain departments of

geology. These departments as a rule have from two to ten men, and a few are larger. The departments give instruction in the various branches of geology, such as mineralogy, petrology (the science of rocks), economic geology, paleontology (the study of fossils), and engineering geology, etc. To be a good instructor in one or more branches of geology one should have a training and experience acquired in part by geological field-work.

Geologists in Government Service

The largest group of geologists in the United States is employed by the United States Geological Survey, with its central office at Washington, D. C. These men are engaged chiefly in mapping the rock formations of the United States and Alaska and in studying their valuable mineral deposits. They write reports with maps, which describe the rocks and the mineral deposits, and which serve as guides for exploration and for working the deposits. Men are selected for positions on the Survey by competitive examinations given by the United States Civil Service Commission. These examinations are held in most of the large cities in the United States every year or two, and the men employed are those who obtain the highest marks. Most of the states also support geological surveys to do similar work.

The United States Bureau of Mines employs a considerable number of geologists to collect and study statistics of mineral production, and also to work on various mining and other problems. In the Smithsonian Institution at Washington, and in other institutions and museums throughout the country, geologists are engaged in the study of a great variety of problems and in the preparation of material for exhibition and instruction.

Geology's Value to Industry

Nearly all mining organizations employ one or more geologists. These organizations find that they can work their deposits more profitably by having accurate maps showing their distribution; and that a knowledge of the occurrence and origin of the deposits is essential for the intelligent exploration and prospecting of mineral lands. Most mining companies have accurate geological maps of their properties, and it is part of the geologist's work to keep these up to date as mining progresses. A considerable number of geologists find employment in the examination and valuation of mines and prospects that are for sale, and in connection with tax problems and other legal matters.

All of the larger oil companies also maintain geological staffs. Most oil and gas deposits are found along with salt water in porous rocks that are deeply buried beneath the earth's surface and that are arched up. The oil and gas, because they are lighter than the water, rise to the tops of the arches. By mapping the rocks above the oil-bearing beds, it is possible to locate the top of an arch and thus to discover the places that are most likely to be productive (*see Petroleum*). Nearly all wells are drilled on the advice of geol-

ogists, whose services are in demand also in connection with exploitation and management of oil fields.

Aside from the four major lines of endeavor outlined above, the geologist finds employment in connection with problems of trade, of land valuation and classification, of agricultural and soil surveys, and many others. His advice is often required in con-

nection with engineering problems such as the location of dam sites, water and sewage systems, irrigation and drainage projects, and foundations for buildings. Many errors in the location of dam sites and similar engineering projects that have resulted in the loss of life and property could have been avoided if the companies responsible had sought geological advice.

The SCIENCE that Measures ANGLES, SURFACES, SOLIDS

GEOMETRY. As its Greek name indicates, geometry (from *geo*, "earth," and *metron*, "measure") had its origin long ago in earth measurement, not with the Greeks, but before them with the Babylonians and Egyptians. The lands of Egypt swept by the floods of the Nile had often to be resurveyed and meas-

ured to establish the vanished boundaries; and in 2000 B.C. the rope stretchers or surveyors of Egypt had their crude way of erecting a perpendicular and knew without formal demonstration that the square on the hypotenuse of a right triangle whose sides were 3, 4, 5, is equal to the sum of the squares on the other two sides. Even in building the pyramids some applications of geometry were necessary. The reasoning mind of the Greek made of all this a body of mathematical knowledge that had to do with the measurement of space. "Plane geometry" deals with circles, angles, squares, etc.; that is, it is two-dimensional; and "solid geometry" with cubes, spheres, and other three-dimensional bodies.

In the history of the Greek development of geometrical reasoning there are many names, but three stand out: Thales (640 B.C.—about 550 B.C.), one of the "seven wise men," is credited with originating the geometry of lines and angles and developing demonstrations of things which others took for granted. Pythagoras, his pupil (569 B.C.—about 500 B.C.), and the members of the great Pythagorean school studied mathematics in secret. Pythagoras is known to have proved that *the square on the hypotenuse of a right triangle is equal to the sum of the*

NEXT to arithmetic no other branch of mathematics is so frequently used in our daily life as is geometry. When the farm or city lot and street on which you live were measured off and their boundaries determined, geometry was put to use. When architects planned and carpenters built your house and determined its lines and the steepness of the roof, they measured angles and lines and used geometry. When ships sail the sea to bring your food and clothing, their course and their cargo capacity have been based on geometrical knowledge. When you read in this book about the height of mountains, the boundaries of states and countries, or even examine the diagram of how a baseball diamond is laid out, you are learning of geometry and its applications.

squares on the other two sides, and this is known as the Pythagorean theorem. Euclid (about 300 B.C.) is the one name known when all others are forgotten in the history of geometry; his work has been the standard almost down to our own day.

The student who approaches the study of geometry must be thoroughly familiar with the measuring of lines—that is, from point to point—by practice with a rule, a compass, or squared paper ruled to inches and fractions of an inch. When he applies this to measuring a room it is with the object of applying another fundamental idea of geometry, that of ratio. When we say a room is ten yards long we mean that it is ten times as long as the standard unit, a yard; that is, the ratio of the yardstick to the length of the room is as 1 to 10. The ratio is the quotient of one number divided by another, $\frac{10}{1}$. Every measurement is the determination of a ratio of some sort and is often expressed as a fraction.

From these simple exercises we may proceed to some of the simpler geometrical constructions that arise out of the relation of lines to one another and to the definition of the basic terms used in geometry.

If a straight line, as *OX* in any of the drawings of Fig. 1, rotates in a plane about a fixed point, as *O*, in the direction indicated by the arrowheads (counterclockwise) until it reaches the position *OT*, it is said to turn through the angle *XOT*. Thus, an angle is the amount of turning made by a line rotating about a fixed point in a plane

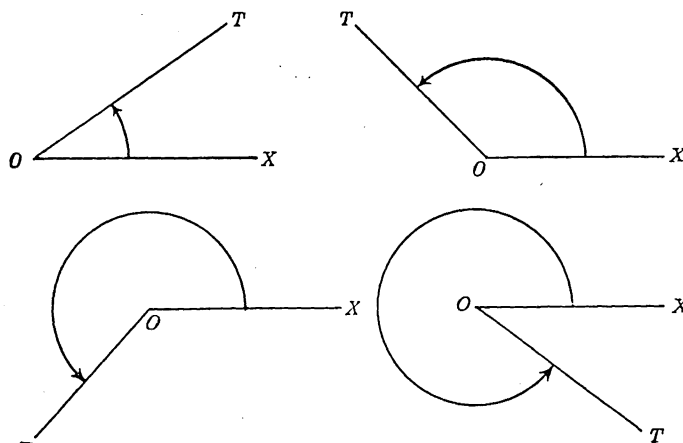


Fig. 1. Illustrating the Definition of an Angle

(flat surface). As the rotation continues, the size of the angle increases.

Vertex.—The fixed point O is called the vertex of the angle.

Initial and Terminal Sides.—The line OX is called the initial side of the angle. The line OT is called the terminal side.

Symbol for Angle.—The symbol for "angle" is \angle ; for "angles" it is \angle s. Thus, Angle XOT is written $\angle XOT$.

Kinds of Angles.—If a line rotates about a fixed point in a plane so as to make one-fourth of a complete turn, the angle formed is called a "right angle" (rt. \angle). (See Fig. 2a.)

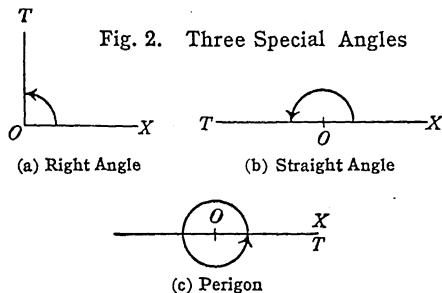


Fig. 2. Three Special Angles

If the line makes one-half of a complete turn, the angle formed is called a "straight angle" (st. \angle). (See Fig. 2b.) If the line makes a complete turn, the angle formed is called a perigon. (See Fig. 2c.)

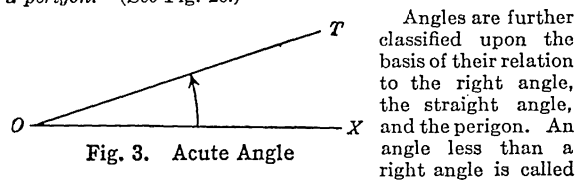


Fig. 3. Acute Angle

an "acute angle" (Fig. 3). An angle which is greater than a right angle and is less than a straight angle is called an "obtuse angle" (Fig. 4). An angle greater than a straight angle and less than a perigon is called a "reflex angle" (Fig. 5).



Fig. 4. Obtuse Angle

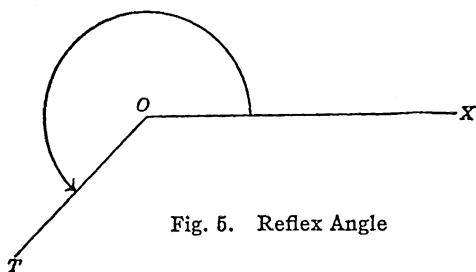


Fig. 5. Reflex Angle

Notation for Reading Angles.—There are three common methods by which one may denote angles: (1) Designate the angle formed by two lines OX and OT , as the "angle XOT " or the "angle TOX ". Here the first and last letters denote points on the lines forming the angle, and the middle letter denotes the point of intersection (the vertex). In reading "angle XOT " we regard OX as the initial side and OT as the terminal side. (2) Denote the angle by a small letter placed as x in Fig. 7. In writing equations

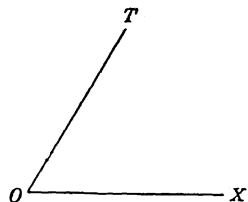


Fig. 6

this method is the most convenient. (3) Denote the angle by the letter which is written at the point of intersection of the two sides of the angle, as "angle A ." This last method is used only when there is no doubt as to what angle is meant.

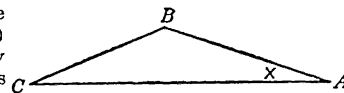


Fig. 7

If a line OX be taken as the initial side of an angle (see Fig. 8), and the line be rotated one complete turn (a perigon), any point, as P , on the line OX will trace a curved line which we call a "circle." Thus a circle is a closed curve, all points of which lie in the same plane and are equally distant from a fixed point.

The following terms are used in connection with the circle: **Center and Circumference.**—The fixed point O is the "center" of the circle. The length of the curve (circle) is called the "circumference" (distance around) of the circle. **Radius and Diameter.**—A line drawn from the center of a circle to any point on the circle is a "radius." Thus, OP is a radius of the circle. A line connecting two points on the circle and passing through the center of the circle is called a "diameter."

From the definition of "radius" given above it is clear that in a given circle or in equal circles one radius has the same length as any other. Thus we obtain the following important geometric relation: *Radii of the same circle or of equal circles are equal.* ("Radii" is the plural of "radius.")

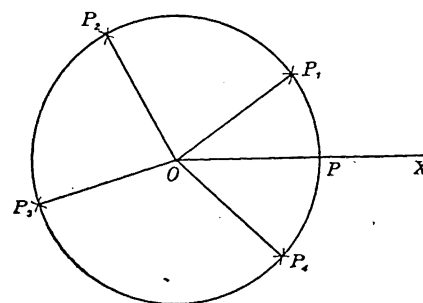


Fig. 8. The Circle

Ratios and Measurements. The circumference of a circle has a certain ratio to the diameter which is denoted by the Greek letter π (π). The value of π is usually taken as 3.1416. The circumference of a circle, therefore, is expressed by the formula $2\pi r$, and the area by πr^2 , in which r is the length of the radius.

Arc; to Intercept; Central Angle.—An "arc" is a part of a circle. If two radii are drawn from the center of the circle to two different points on the circle, they cut off an arc on the circle. The symbol for "arc" is \frown . Thus, $\frown AB$ is read "the arc AB ." The angle formed at the center of the circle is said to "intercept" the arc. The angle at the center is called a "central angle."

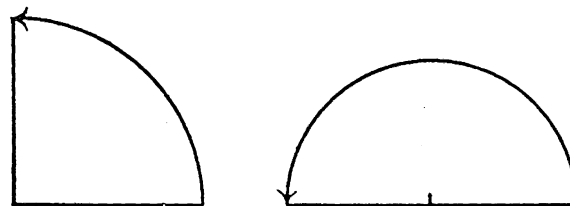


Fig. 9. Quadrant and Semicircle

Quadrant and Semicircle.—An arc equal to one-fourth of a circle is called a "quadrant." An arc equal to one-half of a circle is called a "semicircle" (Fig. 9).

How We Measure Angles.—In many instances the process of measuring angles is as important as that of measuring distances. An angle is measured when we find how many times it contains another angle selected as a unit of measure.

The "protractor" is an instrument devised for measuring and constructing angles. The protractor commonly consists of a semicircle divided into 180 equal parts. Each of these equal parts is called a degree of arc (1°). In the geography work in the grades, the unit for longitude and latitude was the degree of arc. In the measurement of angles we shall consider a unit corresponding to a unit of arc and called a "degree of angle."

If straight lines are drawn from each of these points of division on the semicircle to the center O , 180 equal angles are formed, each of which is a degree of angle (1°). Thus, the "unit" of angular measure is the "degree." A degree is divided into 60 equal parts, each of which is called a "minute" ($1'$).

Each minute is divided into 60 equal parts, each of which is called a "second" ($1''$). Of course the minute and the second graduations are not shown on the protractor.

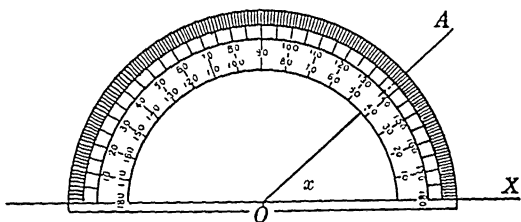


Fig. 10. Measuring Angles with a Protractor

How to Use the Protractor.—The protractor may be used to measure a given angle. Thus, to measure a given angle x place the protractor so that the center of the protractor (point O in Fig. 10) falls upon the vertex and makes the straight edge of the protractor coincide with (fall upon) the initial side of the given angle x . Now, observe where the terminal side of the given angle intersects (crosses) the rim of the protractor. Read the number of degrees in the angle from the scale on the protractor.

The protractor is also useful in constructing angles of a required size. For example, to construct an angle of 42° draw a straight line OX (Fig. 10) and place the straight edge of the protractor on the line OX so that the center rests at O . Count 42° from the point on OX where the curved edge touches OX and mark the point A . Connect A and O , and the angle thus formed will contain 42° .

Some Simple Problems in Construction

One of the important phases of geometry work is that of constructing perpendiculars, angles, parallel lines, and so on.

For example, let us consider the following problem:

At a given point on a given line to erect a perpendicular to that line by using ruler and compasses.

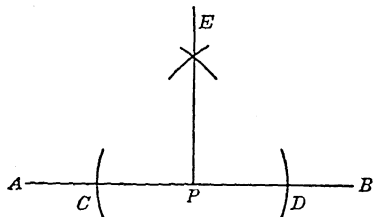


Fig. 11. How to Erect a Perpendicular

Construction: Let AB be the given line and P the given point (Fig. 11). With P as a center and with a convenient radius draw arcs intersecting AB at C and D .

With C and D as centers and with a radius greater than $\frac{1}{2} CD$ draw intersecting arcs. Call the point of intersection E , and draw EP . Then EP is the required perpendicular.

Another well-known construction problem is this:

At a given point on a given line to construct by means of a ruler and compasses an angle equal to a given angle.

Construction of an Angle.—Let DEF in Fig. 12 be the given angle and let P be the given point on the given line AB .

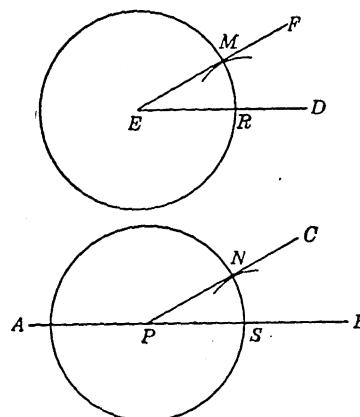


Fig. 12. Constructing an Angle Equal to a Given Angle

With E as a center and ER as a radius, draw a circle. With P as a center and with the same radius (ER) draw another circle. Place the sharp point of the compasses at R and cut an arc through M . With S as a center and the same radius cut an arc at N .

The $\angle BPC$ is the required angle.

Definitions.—If two lines form right angles with each other, they are said to be "perpendicular." The symbol for "perpendicular" is \perp . The meaning of "parallel lines" is shown by Fig. 13. AB and CD in that figure have had the same amount of angular rotation from the initial line EF . Thus, they have the same direction and are said to be "parallel." The symbol for "parallel" is \parallel . Thus, $AB \parallel CD$, is read " AB is parallel to CD ."

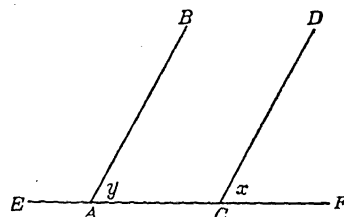


Fig. 13. Parallel Lines

Angles x and y in Fig. 13 are called "corresponding" angles. The line EF is called a "transversal." It is clear that the lines are parallel only when the corresponding angles are equal and that the corresponding angles are equal only when the lines are parallel.

Another important construction problem is that of drawing a line parallel to a given line. This we shall now explain.

Construction: Choose a point P outside the given line AB (Fig. 14). Draw a line through P so as to form a convenient angle x with AB . Call the point of intersection D . At P , using DP as initial line, construct an angle y equal to angle x (use method shown in Fig. 12). Then PR and AB are parallel because they have had the same amount of rotation from the initial line PD .

If one pair of parallel lines cross (intersect) another pair, the four-sided figure thus formed is called a "parallelogram"; that is, a *parallelogram* is a quadrilateral whose opposite sides are parallel.

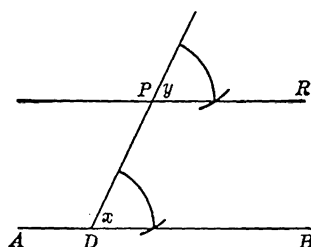


Fig. 14. How to draw Parallel Lines

If we remember the method used for constructing one line parallel to another, it will be easy to construct a parallelogram.

Construction: Draw a working line AB (Fig. 15). Draw AR making a convenient angle with AB . Through any point, as P , on AR draw a line PV parallel to AB . Through any point as M on AB draw a line MT parallel to AR . The figure $AMSP$ is a parallelogram, for its opposite sides are parallel.

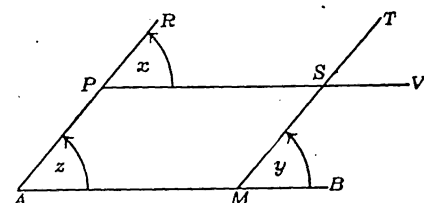


Fig. 15. How to construct a Parallelogram

If one of the interior angles of a parallelogram is a right angle, the figure is a *rectangle* (Fig. 16). Thus, a *rectangle* is a *parallelogram* in which one interior angle is a right angle. If all the sides of a rectangle are equal, the figure is called a "square" (Fig. 17).

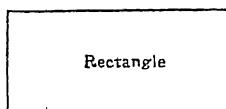


Fig. 16

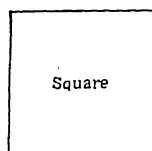


Fig. 17

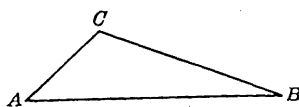


Fig. 18

If we determine the amount of area inclosed within a polygon, or several-sided figure, as in the triangle ABC in Fig. 18, we are *measuring the area* of the triangle. As in measuring length, the process is one of comparison.

We compare the area of the given polygon with some standardized (defined and accepted) unit of area and determine how many units are contained in the polygon; that is, we determine the ratio between the area of the given polygon and a standard unit of area.

The unit of area is a square, each of whose sides is a standard unit of length. Such a unit involves length and width. Thus, we may measure area and express

the result in square feet, square inches, square meters, square centimeters, etc.

The drawings in Fig. 19 represent geometric solids. A solid is commonly thought of as an object that occupies a portion of space. It is separated from the surrounding space by its surface. In geometry we study only the form of the solid and its size. We are not interested in color, weight, etc. A solid differs from the figures we have been studying in that it does not lie altogether in a plane, but involves a third dimension.

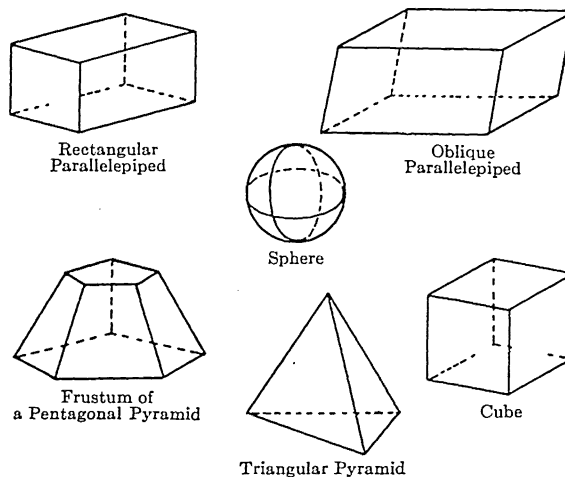


Fig. 19. Familiar Solids

Cube.—The cube has six faces all of which are squares. Two faces intersect in an edge.

Oblique Parallelepiped.—The faces of an oblique parallelepiped are all parallelograms.

Rectangular Parallelepiped.—The faces of a rectangular parallelepiped are all rectangles.

Measurement of Volume; Unit of Volume.—When we determine the amount of space inclosed within the surface of a solid we are measuring the "volume" of the solid. To measure the volume of a solid we compare the solid with a cube each of whose edges equals a unit of length. The volume is expressed numerically by the number of times the unit cube goes into the solid. The unit cube is called the *unit of volume*.

Essential Terms Defined

It is equally important that we should keep clearly in mind the definitions of certain geometrical terms.

Theorem.—In our geometry work we are concerned mostly with the proving of certain geometric relations. For example, we may prove that "The sum of the interior angles of a triangle is a straight angle." Such a statement of a geometric relation is called a "theorem." Thus a theorem is something to be proved.

Problem.—A "problem" in geometry is something to be done. Thus "To draw a perpendicular to a given point in a line" is a problem.

Proposition.—A "proposition" in geometry may be either a theorem or a problem.

Exercise.—A theorem or problem is often called an "exercise."

Corollary.—A truth which may grow out of or depend upon the truth of a proposition is called a "corollary."

In geometry we should know the following:

Outline of angle pairs formed by two lines cut by a transversal. When two lines are cut by a transversal, as in Fig. 20—

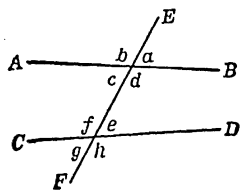


Fig. 20

angles c, d, e, f , are called "interior" angles;
angles a, b, g, h , are called "exterior" angles;

the angles of the angle pairs $\begin{cases} a \text{ and } e \\ b \text{ and } f \\ c \text{ and } g \\ d \text{ and } h \end{cases}$ are called "corresponding" angles;

the angles of the angle pairs $\begin{cases} d \text{ and } e \\ c \text{ and } f \end{cases}$ are called "interior" angles on the same side of the transversal;

the angles of the angle pairs $\begin{cases} d \text{ and } f \\ c \text{ and } e \end{cases}$ on opposite sides of the transversal are called "alternate-interior" angles;

the angles of the angle pairs $\begin{cases} b \text{ and } h \\ a \text{ and } g \end{cases}$ on opposite sides of the transversal are called "alternate-exterior" angles.

The student of geometry should be careful to remember—

- | | |
|--|--|
| (a) that corresponding angles are equal; | } only when the lines cut by the transversal are parallel. |
| (b) that alternate-interior angles are equal; | |
| (c) that alternate-exterior angles are equal; | |
| (d) that interior angles on the same side of the transversal are supplementary | |

Geometrical Methods of Proof

In geometry we have various methods of proving propositions. There is no one particular or invariable method of proof. The student of geometry should therefore become familiar with these methods. We shall explain each and illustrate some by examples.

The demonstration of a theorem consists of three parts: the part that is given (the *hypothesis*), the part that is to be proved (the *conclusion*), and the *proof*. And in proving a theorem one should give a reason for each step taken.

The briefest general directions for proving a proposition are:

- (1) Be sure to read the proposition carefully.
- (2) If the proposition is a theorem or exercise, draw a careful general figure, i.e., if the theorem concerns a triangle draw a triangle all of whose sides are unequal (scalene) and not one all of whose sides are equal (equilateral) or one two of whose sides are equal (isosceles).
- (3) Write down clearly the hypothesis (the given part) and the conclusion (what is to be proved) and do this in terms of the letters in your figure.
- (4) Try to work out the proof by falling back on anything you have previously learned that may apply, or draw some construction line or lines that may suggest the proof.
- (5) Follow the outline given below for the form of your proof.

This makes it necessary to base each statement on (1) the hypothesis, (2) an axiom, (3) a definition, or (4) some other theorem which has previously been proved by geometrical methods.

The following proof will serve as an illustration: The theorem is: *The sum of the interior angles of a triangle is 180°* (Fig. 21).

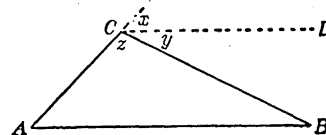


Fig. 21

Hypothesis: Triangle ABC .

Conclusion: $\angle A + \angle B + \angle C = 180^\circ$.

Proof:

Draw $CD \parallel AB$.
Then $\angle x = \angle A$.

And $\angle y = \angle B$.

But $\angle x + \angle y + \angle z = 180^\circ$.

$\therefore \angle A + \angle B + \angle C = 180^\circ$.

REASONS
Because corresponding angles formed by two parallel lines cut by a transversal are equal.

Because alternate-interior angles formed by parallel lines cut by a transversal are equal.

Because the sum of all the angles about a point in a plane on one side of a straight line is 180° .

By substituting $\angle A$ for $\angle x$, $\angle B$ for $\angle y$, and $\angle C$ for $\angle z$.

At the end of such a demonstration we generally write Q. E. D. (*Quod erat demonstrandum*, "which was to be demonstrated"); or if it is a proposition, Q. E. F. (*Quod erat faciendum*, "which was to be done").

METHOD OF PROOF BY SUPERPOSITION. The method of proof by superposition is the method used to show that certain figures have the same shape and same size (congruent figure). The symbol for "congruent" is \cong . It is the method always used to prove two triangles congruent when two sides and the included angle of one are equal respectively to two sides and the included angle of the other. The proof is as follows (Fig. 22):

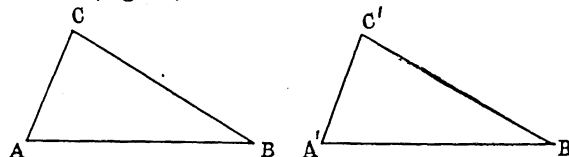


Fig. 22

Hypothesis: $\triangle ABC$ and $\triangle A'B'C'$ with $AC = A'C'$, $AB = A'B'$ and $\angle A = \angle A'$.

Conclusion: $\triangle ABC \cong \triangle A'B'C'$.

Proof:

Imagine the triangle ABC placed upon the triangle $A'B'C'$ so that angle A shall fit exactly upon its equal angle, A' , AB falling upon $A'B'$ and AC upon $A'C'$.

Then since AB is given equal to $A'B'$, B will fall upon B' and since AC is given equal to $A'C'$, C will fall upon C' .

Then BC will fall along and coincide with $B'C'$, else there would be two different straight lines connecting the two points B and C , and this is evidently impossible because only one straight line can be drawn between two points.

Hence, the two triangles are congruent, i.e., they coincide, or fit.

Since ABC and $A'B'C'$ are any two triangles having two sides and the included angle of one equal to the corresponding parts of the other, the theorem is true.

METHOD OF PROOF BY CONGRUENT TRIANGLES. In order to prove that certain lines or angles are equal it

is often expedient to show that the lines or angles are corresponding (homologous) parts of congruent triangles and are therefore equal.

For example, let us suppose we want to show that the base angles of an isosceles triangle are equal. To do this we would bisect the vertex angle of the isosceles triangle and then prove the two triangles thus formed congruent. The base angles of the original isosceles triangle would then be corresponding parts of the two little congruent triangles and therefore would be equal.

INDIRECT METHOD. The indirect method or *reductio ad absurdum* (reducing to an absurdity) method is one that is sometimes employed in geometry. The following proof will illustrate:

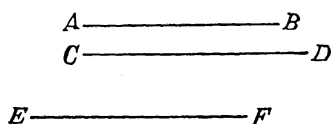


Fig. 23

Theorem: If each of two lines is parallel to a third line, they are parallel to each other (Fig. 23).

Given: AB and CD each parallel to EF , to prove $AB \parallel CD$.

Proof:

STATEMENTS

Suppose AB is not parallel to CD and that they meet at some point P . Then, through P there would be two lines parallel to EF which is impossible.

Therefore AB and CD lying in the same plane do not meet. Hence they are parallel.

REASONS

Because through a point outside a given line only one line can be drawn parallel to the given line.

Because when two lines lie in the same plane and do not meet, they are parallel.

METHOD OF ANALYSIS. The method of analysis is a very powerful and useful method in geometry, especially in construction work.

Let us take the following problem as an illustration: From a point outside a circle to draw a tangent to the circle.

Given: a circle whose center is O and a point P outside the circle (Fig. 24).

Required: to draw a line from P tangent to the circle.

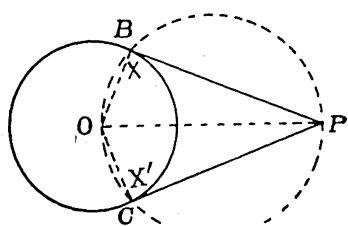


Fig. 24

Analysis: Imagine the two possible tangents drawn. Connect O and P . Draw OB and OC . Then if PB and PC are to be tangent to the circle, $\angle x$ and $\angle x'$ must be right angles, because a tangent to a circle is \perp to a radius drawn to the point of contact. This suggests the construction, for we know that if a second circle is drawn on OP as a diameter, $\angle x$ and $\angle x'$ will be right angles, because all angles inscribed in a semicircle are right angles. (An angle is said to be "inscribed" when it is made between two lines, one of which runs from any point such as X on the dotted semicircle to one end of the diameter, O , while the other runs from the point X to the other end of the diameter, P . It can be proved, although the proof is not

given here, that such an angle in a semicircle is always a right angle.)

Construction: Start with given circle and point P outside. Draw OP . Then on OP as a diameter construct a circle. Draw PB and PC and they are the required tangents.

Proof:

STATEMENTS

Draw radii BO and CO . Then $\angle x$ and $\angle x'$ are each right angles.

Then PB and PC are tangent to the circle.

REASONS

Because any angle inscribed in a semicircle is a right angle.

Because a line drawn perpendicular to a radius at its outer extremity is tangent to the circle.

CONVERSE. The "converse" of a proposition is another proposition such that what is given in the first is to be proved in the second and what is to be proved in the first is given in the second.

For example, "An equiangular triangle is equilateral" is the converse of "an equilateral triangle is equiangular" (Fig. 25).

Not all converse propositions are true. The one above is true, but consider the following: "All congruent triangles are similar."

Conversely, "All similar triangles are congruent" is not true.

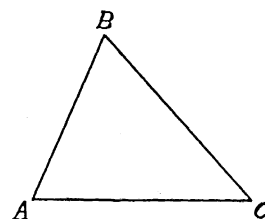


Fig. 25

METHOD OF PROOF BY ELIMINATION. The method of proving a proposition by eliminating all of the possibilities except one is sometimes used in geometry. For example, let us take the theorem, *In any triangle where two sides are unequal, the angles opposite these sides are unequal in the same order.*

Given: $\triangle ABC$ with $AB < AC$.

To prove: $\angle C < \angle B$.

Proof:

STATEMENTS

There are three possibilities:

(1) $\angle C = \angle B$

(2) $\angle C > \angle B$

(3) $\angle C < \angle B$

$\angle C$ cannot equal $\angle B$.

$\angle C$ is not greater than $\angle B$.

Therefore $\angle C < \angle B$

REASONS

Because if it were, AB would equal AC and this is not true.

Because if it were, then $AB > AC$ and this is not true.

By eliminating the other two possibilities.

DIRECT OR SYNTHETIC METHOD. The direct or synthetic method is the one commonly employed by textbook writers for setting down their proofs. It is logically ordered and more elegant than the analytic method. An example is given in Fig. 21 where the theorem *The sum of the interior angles of a triangle equals 180°* is proved. This method is the highly finished method and is the one which we use to write out our final proof in a most finished form.

The reader should endeavor to master all of the methods given here and consult the ordinary school textbooks for illustrative material.

More advanced branches of geometry than the plane and solid are "*analytical geometry*," a combination of algebra and geometry which can be studied after one has mastered elementary algebra and geometry; and "*projective geometry*" which treats not so much the figures but their projections. The subject, however,

is extremely interesting and helpful and throws much light on the elementary field. *Non-Euclidean* geometry builds up a system based on other views of the properties of parallel lines than that in the Euclidean. It usually rejects the Euclidean assumption that parallel lines never meet, and is complex.

ENGLAND'S GEORGES and the House of Hanover

Rise of Cabinet Government under the First Two Georges—Injuries Wrought by the Stupid Stubbornness of George III—Change of the Family Name by George V

GEORGE, KINGS OF ENGLAND. It was the marriage of the daughter of James I of England to Frederick, Count Palatine of the Rhine (see Thirty Years' War), that eventually brought to the British throne the German or Guelph (Guelph) line of rulers, six of whom have borne the name of George.

GEORGE I, a grandchild of this marriage, was Elector of Hanover, a north German state, and succeeded to the British throne as the nearest Protestant heir on the death of Queen Anne. He ruled Great Britain, in addition to his German state, from 1714 to 1727, dividing his time between the two countries. He was a silent awkward man, 55 years of age when he came to the English throne, and spoke only German. Because of this and of his paramount interest in his German lands, he left almost everything to his English ministers, in whom he had implicit confidence. He gradually ceased even to attend cabinet meetings. Sir Robert Walpole, the head of the cabinet and the first real prime minister, became in effect the actual ruler of Great Britain so long as he was supported by



GEORGE I
First of the Hanoverians

Parliament (see Cabinet). Adherents of the Jacobite (exiled Stuart) line were easily put down in 1715.

George's wife, Sophia Dorothea, was divorced for misconduct in 1694, and kept in seclusion until her death in 1726. With this ruler began the habit of bad relations between the king and his heir, the Prince



GEORGE II
Under Him Cabinet Government Prevalled.

of Wales, which lasted through the 18th century.

GEORGE II, 1727-1760, the son of George I, was, like his father, more interested in Hanover than in

England. He was a vain pompous little man, fond of show but extremely economical. One of his favorite diversions, it is said, was counting his money like the king in the nursery rhyme. Although George II spoke English brokenly he too left the management of affairs first to Walpole and later to the elder William Pitt, under whom the country gained brilliant victories in the French and Indian War (see Chatham, William Pitt, Earl of). The Jacobite rising of 1745 was a much more serious affair than in 1714, but it too proved unsuccessful (see Pretender). George's queen, Caroline of Anspach, was a woman of remarkable ability and proved a tower of strength both to her weak husband and to his English ministers.

GEORGE III, the grandson of George II, reigned from 1760 to 1820.

He was born in 1738. His father, Frederick, Prince of Wales, who had been on the worst possible terms with George II, had died in 1751. George III was the first of the Hanoverian rulers who was born and educated in Britain. From his teachers, especially the Scottish Earl of Bute, and from his mother—who continually urged him, "George, be king"—George III drew the idea of restoring the king of England to his old position of power.

But this could have been done only by a strong king, and George III had only average ability. He had, however, more than average obstinacy, and he refused to give up his course until he lost for England her 13



GEORGE III
He Caused the Revolt of the American Colonies.

American colonies and "inflicted more profound and enduring injuries upon his country than any other modern English king." Lecky, the British historian

just quoted, further says that George III spent his long reign—longer than that of any other British ruler except Queen Victoria—in “obstinately resisting measures which are now almost universally admitted to have been good, and in supporting measures which are as universally admitted to have been bad.” By gifts of offices, titles, contracts, and even money bribes, he sought to build up in Parliament a party known as “the king’s friends.” When the American colonists triumphed at Yorktown in 1781, the king’s reactionary rule collapsed, and the liberal-minded Whigs took control of the government. He had long been subject to fits of insanity, and during his last ten years he was a blind and insane wreck.

GEORGE IV, who was born in 1762 and reigned from 1820 to 1830, was the son of George III. For nine years before his accession he had been Prince Regent, because of his father’s insanity. He was a dissolute and incompetent ruler, though he posed as “the first gentleman of Europe.” His treatment of his young queen, Caroline of Brunswick, was abominable, and when he attempted to divorce her, a wave of indignation swept over the land. The government, both in Great Britain and Hanover, was in the hands of his ministers. Since his only child, a daughter, had died, his brother, William IV, succeeded him in 1830 (see William, Kings of England).

A Wise and Careful Monarch

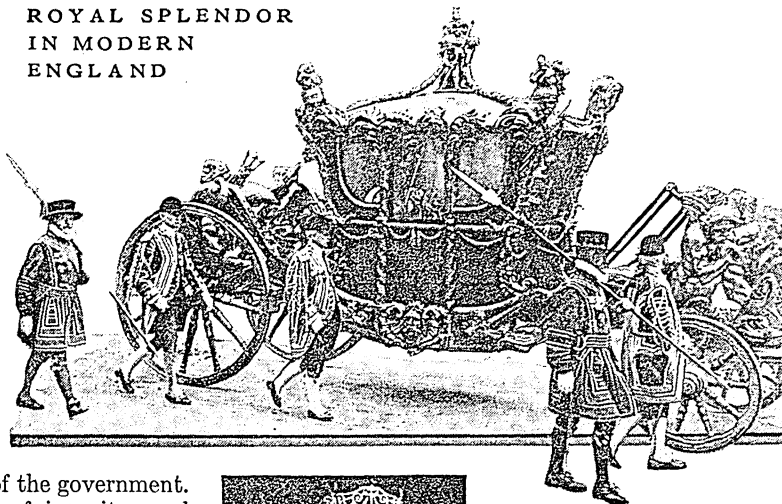
GEORGE V, who was born in 1865 and reigned from 1910 to 1936, was the grandson of Queen Victoria, and the son of Edward VII. From the age of 12 he was trained for the sea, and he had risen to be a commander in the British navy when the death of his elder brother made him, at the age of 26, the heir to the throne. Like his father, George V gained personal knowledge of the outlying posts of the empire by a tour of the colonies before he became king.

In 1893 he married Victoria Mary, Princess of Teck. Their quiet home life was pointed out as an example for the British people. There were six children: Edward (who became Edward VIII and then abdicated), Albert (who became George VI), Mary, Henry, George, and John (who died in childhood).

Four years after George V came to the throne, the World War broke out. During the conflict he crossed over to France several times, being the first British king since 1743 to visit his armies in the field. He cut himself off from all German connections and titles, and announced that the royal line would thenceforth be known not as the House of Saxe-Coburg-Gotha but as the House of Windsor, from the royal castle of that name in England.

The reign of George V was an epochal period, not

ROYAL SPLendor IN MODERN ENGLAND



At the top is the Royal coach built in 1761 for George III and used ever since on state occasions. Around it are quaintly clad Yeomen of the Guard, called “Beef-Eaters.” Below, in full court costume, is Victoria Mary of Teck, who was Queen Mary during the reign of her husband, George V, and who became the Queen Mother after the accession of George VI. At the right stands George V in the uniform of Colonel-in-Chief of the Royal Horse Guards.

only because of the war, but also because of other momentous events. Among these were controversies between the House of Lords and the Commons, changes in the status of the British colonies, creation of the Irish Free State, disturbances in India, violent strikes, and long-continued financial depression. During these disrupting influences and in the face of the downfall of most of the thrones of Europe, the amiable personality of George V and his willingness to be guided entirely by the advice of his ministers made the throne an effective instrument for conciliating factions at

GEORGE VI AND THE ROYAL FAMILY

home and maintaining patriotic unity among the far-flung dominions of the empire, which had now become self-governing commonwealths.

At his Silver Jubilee, celebrated May 6, 1935, the empire gave striking evidence of its loyalty and affection for the royal house. Eight months later, after a three-day illness, he died, Jan. 20, 1936, and was buried in St. George's Chapel, Windsor.

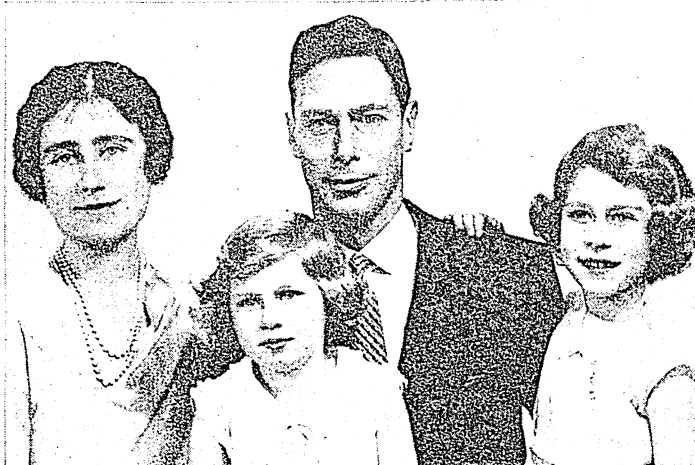
GEORGE VI, second son of George V, became king on the abdication of his brother, Edward VIII, Dec. 11, 1936 (see Edward, Kings of England). He was crowned on May 12, 1937. Born Dec. 14, 1895, he was baptized Albert Frederick Arthur George. He was called by the first of these names until he succeeded to the throne, when he took the name George in honor of his father.

He was a shy, sensitive child and the efforts that were made to alter his left-handedness may have fastened upon him, as is not uncommon in such cases, the habit of stammering. Despite his conscientious work, he ranked low in his classes at the Royal Naval College at Osborne and the naval training school at Dartmouth. He excelled, however, in athletics, particularly in tennis, which he played left-handed.

In the first World War Prince Albert was a sub-lieutenant on H.M.S. *Collingwood*, serving in a gun turret in the battle of Jutland. In 1917, after a serious illness which unfitted him for life at sea, he qualified as a pilot in the Royal Air Force and served as a staff officer in France.

In 1920 his father gave him the title of Duke of York. Three years later he was married at Westminster Abbey to Lady Elizabeth Bowes-Lyon, youngest daughter of the Scottish Earl of Strathmore. This was popularly hailed as a marriage between a royal prince and a "commoner," because the bride, being a younger child, did not inherit a title of nobility. But her family was of ancient noble lineage and the Strathmore estate, Glamis Castle, is the scene of most of Shakespeare's *Macbeth*. In 1926 Princess Elizabeth Alexandra Mary was born and in 1930 Princess Margaret Rose.

Before he came to the throne, Albert represented the royal family on several public missions, particularly in 1927 at the opening of the Parliament houses at Canberra, the newly established capital of the Commonwealth of Australia.



When Albert, Duke of York, took the throne after the abdication of his brother, Edward VIII, his wife became Queen Elizabeth, and Princess Elizabeth (right) became the heir presumptive to the crown, with Princess Margaret next in line.

In 1939 King George and Queen Elizabeth made a "good-will" tour of Canada and the United States. During the second World War that began later that year, they did much to sustain the spirit of the British people. When enemy bombs devastated English cities, their addresses and visits gave courage and consolation to all.

King George's elder daughter, Princess Elizabeth,

is the *heir presumptive* to the throne. This means that she will be queen on her father's death unless her royal parents have a son who, under English law, would become the *heir apparent* or unconditional heir to the throne.

GEORGE, SAINT. The most popular of the many legends of St. George, the patron saint of England, tells how he slew a monstrous dragon against which an armed force had been of no avail (see Dragon). St. George is said to have been a soldier born of noble Christian parents, in Cappadocia, a Roman province of Asia Minor, and to have suffered martyrdom in 303 at Lydda, an ancient town in Palestine.

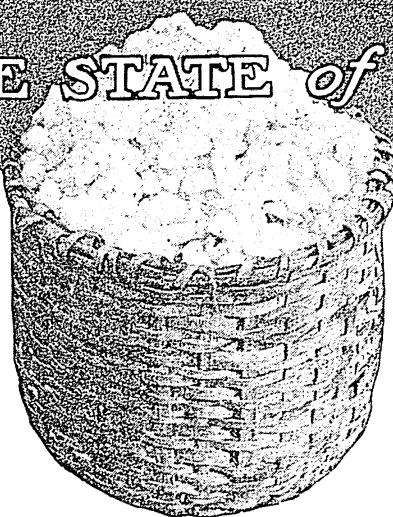
GEORGE JUNIOR REPUBLIC. Near Freeville, N.Y., is a model village made up of boys and girls from 16 to 21 years of age, associated with a few older persons. The young people enjoy complete self-government. They have their own constitution modeled on that of the United States, make their own laws, and elect their own officers. Industries and trades are carried on, and an opportunity is given to every boy and girl to earn money.

The republic was founded in 1895 by William R. George. Started as a summer colony for poor and wayward children, it soon became a permanent institution, where the "citizens" remain for several years. The object is to teach self-reliance, regard for the rights of others, and an appreciation of the duties and difficulties to be encountered in later life.

The village is situated on a 240-acre tract of land. It has its school house, its bank, general store, government building, restaurants, and many workshops. The citizens live in group cottages, each under the care of a house-mother. Model gardens and small farm plots on the outskirts provide agricultural training.

Similar organizations have been founded in a number of other places. In 1908 the National Association of Junior Republics was formed, to coordinate the existing institutions and promote new ones.

The EMPIRE STATE of the SOUTH



GEOORGIA, STATE OF. Greatest in area of all the states east of the Mississippi, with a surface nearly as large as all New England, Georgia stands in the front rank among the states of the Union as regards the value and variety of its products. More than two-thirds of its area is covered with forests; yet it ranks among the foremost states in the value of its agricultural products. Cereals of the temperate zone as well as fruits of the semi-tropics are produced within its borders. It is famous for the value and the quality of its cotton, and corn is a staple crop. Rich quarries add to its wealth, and magnificent water-power helps to convert its cotton and lumber into manufactured articles. This waterpower, in fact, is a tremendous factor in the present life of the "Empire State of the South," as it is popularly called, for it is transforming the state into a manufacturing center of tremendous importance to the South and the nation.

The Lay of the Land

Sloping gradually from the north to the southeast, Georgia is divided naturally into three sections—the northern Appalachian region, the central Piedmont plateau, and the low coastal plain. The first and smallest of these, the "roof garden" of the state, abounds in impressive scenes—waterfalls, cascades, and winding streams, with backgrounds of mountain or hill covered with beautiful forests. Interesting caves are found in many places, some—for example, Hardin's cave near Kingston—of great extent with far-reaching galleries. The northern section is noted also for its charming valleys, which in season are covered with abundant crops of varied cereals, grasses, and fruits.

To the south the Appalachian region gradually gives away to the Piedmont plateau, a level rolling country with only here and there a conspicuous isolated hill. Stone Mountain, 800 feet high and a mile in diameter, is the largest granite dome in North America. It is the site of a great memorial to the Confederacy. This densely populated section has not only the state's greatest proportion of cultivated land—growing great quantities of cotton, as

well as other crops—but the most important cities as well. Dividing it from the coastal plain region is the "fall line," so called because most of the rivers which cross it have rapids at this point. Along this line cities have sprung up on account of the water-power, and also because the fall line marks in most cases the head of river navigation. By drawing a line through Columbus, Macon, Milledgeville, and Augusta, the fall line may be located.

South of the Piedmont region lies the flat coastal plain, covering more than one-half the state, and abounding in large navigable rivers. This section is the region of the sandy "pine barrens," the chief

home of the famous Georgia pine; but it is an important agricultural area as well, for in wide belts the forest lands, when cleared and fertilized with the native marls and swamp muck, become excellent farm lands. In the southeast, extending into Florida, is the beautiful wilderness known as Okefenokee Swamp, covering about 700 square miles. Here are found quantities of long-leaf pine, cypress, and saw palmetto, as well as black gum, tupelo gum, and some live oak. The region has long been a favorite resort with sportsmen because of its variety of birds, fish, and game.

Georgia's greatest wealth-producing factor is cotton, which grows in almost every section of the state, from the valleys in the north to the numerous islands along the coast, though the boll weevil caused a sharp decline in production after 1916. Corn, which ranks next to cotton in importance, is also grown practically everywhere. Fruit abounds in all sections, and includes almost every kind grown in the United States; best known, however, are the peaches, watermelons, and cantelopes, which are grown for the northern markets. Sugar cane, used largely in the manufacture of syrup, is grown over the middle and southern sections. The pecan tree thrives near the coast, and peanuts ("goobers") form a very important crop in many counties. Oats and hay are grown in increasing quantities, and grazing is a profitable industry. Tobacco has recently come to be one of the most valuable crops.

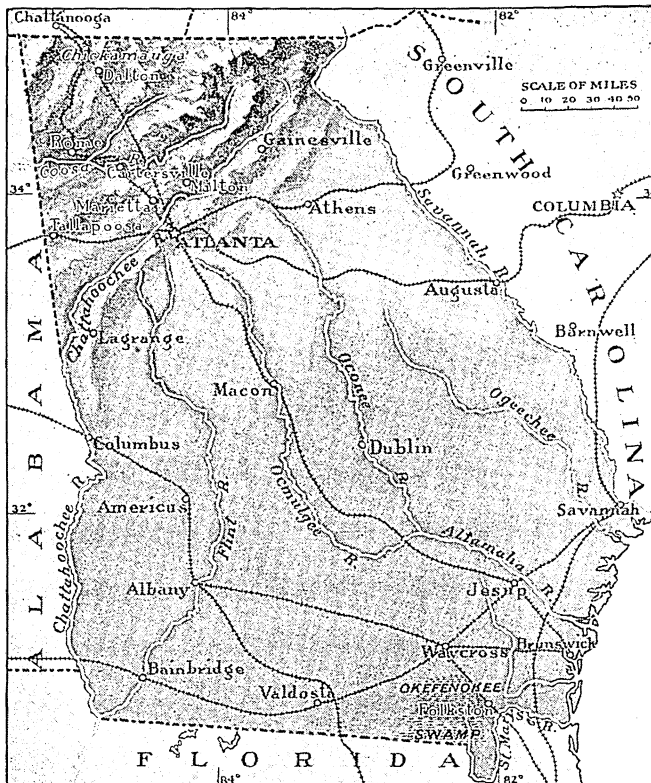
Extent.—North to south, 320 miles; east to west, 253 miles. Area, 58,876 square miles. Population (1940 census), 3,123,723.

Natural Features.—Blue Ridge, Cohutta, Lookout, and Sand ranges in the northern section (highest point, Brasstown Bald Mt., 4,768 feet); Piedmont region, 300 to 1,500 feet; Coastal Plain fringed with marshes and islands along the Atlantic coast. Principal rivers: Savannah, Ogeechee, Altamaha, St. Marys, Flint, Chattahoochee. Mean annual temperature, 64°; mean annual precipitation, 50".

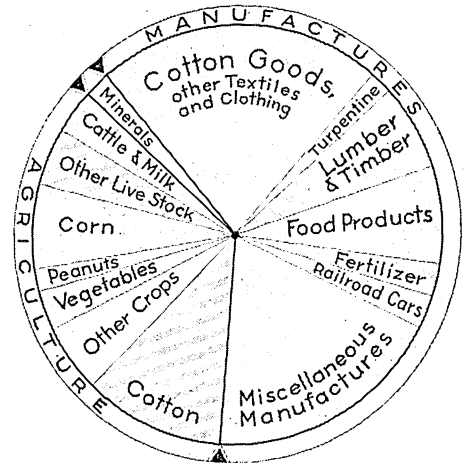
Products.—Cotton, corn, sweet potatoes and yams, hay, tobacco, sugar cane; cotton goods, cottonseed products, packed meats, fertilizers, lumber products, turpentine and rosin; kaolin and other clays, marble and granite, manganese, fuller's earth.

Cities.—Atlanta (capital, 302,288), Savannah (95,996), Augusta (65,919), Macon (57,865), Columbus (53,280).

THE STATE THAT IS FAMOUS FOR COTTON, CORN, AND PINE



The circle shows how the products of its fields and forests enrich the state of Georgia, and below we see how the leading occupations compare.



AGRICULTURE		MANUFACTURING		TRADE & TRANSPORTATION		OTHER OCCUPATIONS	

Georgia's vast forests, which still cover approximately 40,000 square miles, rank next after corn as a source of wealth. No tree in the temperate zone serves better the wants of mankind than does the Georgia pine, which can be utilized from its roots to its needle-like leaves. Its long slender trunk is good for furniture and building; the highest grades of charcoal are made from its bark; both roots and bark are used for lampblack; from the sawdust are distilled wood alcohol and creosote; the sap supplies turpentine and rosin; and the seed is used as food for hogs. The hardwoods found in the northern part of the state are also very valuable.

Georgia has varied mineral resources, over 25 minerals being mined in commercial quantities. Among the most important are iron, coal, manganese, and bauxite. The state is noted for the excellent quality of its marble, which is exceptionally pure and white. Granite is found in inexhaustible quantities, and clay for brick and tile exists throughout the state.

As is to be expected, cotton and lumber form the basis of Georgia's manufacturing industry. Every important city has its textile and cotton-oil mills, and Georgia ranks first among the states in the manufacture of naval stores (rosin, tar, turpentine; etc.). In addition to many furniture factories and lumber mills, there are flour and grist mills, foundries, and manufactories of brick, tile, and pottery.

Only 34.4 per cent of Georgia's population is urban, but it nevertheless contains some of the most im-

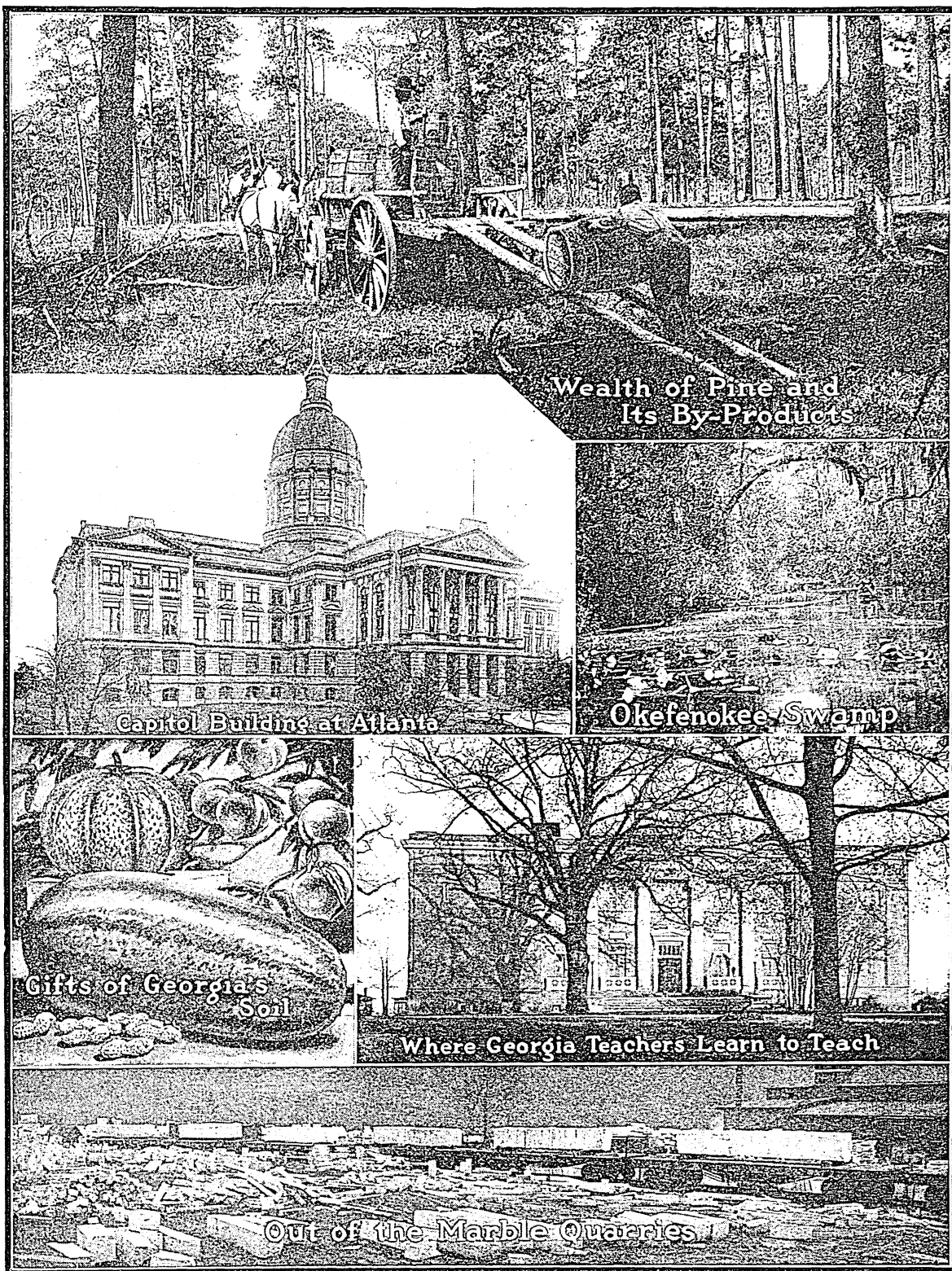
portant cities of the South. Savannah, near the mouth of the Savannah River, is the greatest cotton port on the Atlantic coast, and one of the most important commercial cities of the South (see Savannah). About 200 miles farther up the river is Augusta, a popular winter resort. It is an important cotton and lumber market, and one of the largest cotton-manufacturing centers in the Southern states. Macon, in the center of the state, is remembered as the home of Sidney Lanier, one of the most lyrical of Southern poets; and also as the seat of Wesleyan College, one of the first of women's colleges. Excellent water power is furnished for its cotton and knitting mills by a great dam on the Ocmulgee River. The capital and largest city is Atlanta, in the north-central part of the state (see Atlanta).

Educational Institutions

The negro population of Georgia is large, including about one-ninth of all the negroes in the United States and making up two-fifths of the state's population. There are numerous colleges and industrial schools, including the University of Georgia, at Athens; Georgia State College for Women, at Milledgeville; Georgia School of Technology, at Atlanta; Agnes Scott College, at Decatur; Emory University, near Atlanta; Wesleyan College, and Mercer University, at Macon; La Grange College, at La Grange; and Shorter College, at Rome.

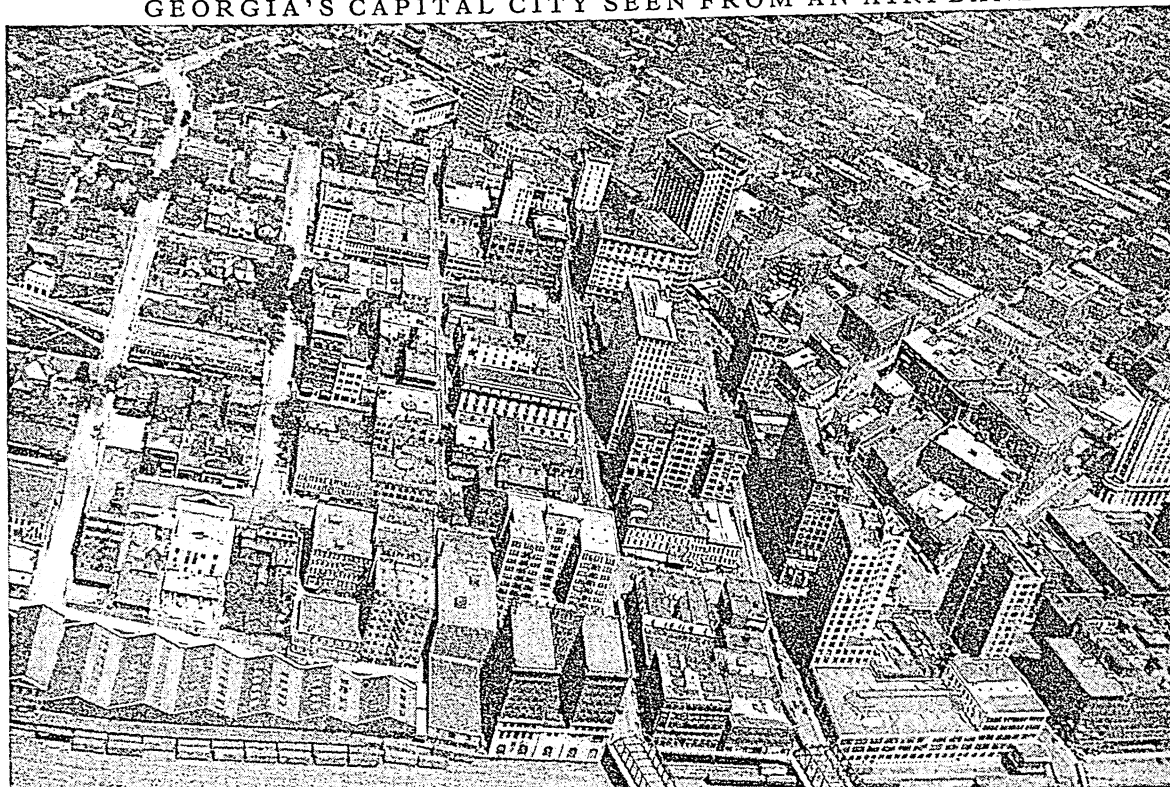
About 1540, Hernando de Soto and his company of adventurers, lured by tales of fabulous wealth to be

GLIMPSES INTO THE HEART OF GEORGIA



Georgia is rich in natural products. Her pine forests are famous the world over, and her rich soil produces typical warm climate crops and such fruits as peaches and melons in abundance, to say nothing of the valuable annual yield of peanuts. Fine grades of marble come from her quarries, and she has large cotton and lumber mills. The scenery of the state is marked by rich vegetation, and her swamp lands teem with varied animal life. Georgia is proud too of the educational advantages afforded by her many institutions of learning. At their head is the State University at Athens, one of whose buildings is shown above.

GEORGIA'S CAPITAL CITY SEEN FROM AN AIRPLANE



This interesting view was taken by an airman flying westward over the principal business district in Atlanta. In the lower left-hand corner is the railway station, while Peachtree Street, the best-known "down-town" thoroughfare, starts in the lower right-hand corner and runs toward the tall building in the upper center.

found in the New World, passed through the present state of Georgia on their way to the Mississippi just below the site of Memphis, Tenn. Thus Georgia became part of the vast territory which Spain claimed as a result of his travels (*see De Soto, Hernando*).

During the next two centuries, the Spaniards established only a few scattered forts along the coast line; and by the end of the 17th century, they were defending their title against the claims of the French in Louisiana and the English in the Carolinas.

The English in Georgia

In 1732, George II, after whom the state is named, granted a charter to a group of wealthy Englishmen headed by Gen. James Edward Oglethorpe, to found a colony. It was planned not only as a haven for debtors, who were crowding English prisons, and for groups of persecuted Protestants in Germany and Austria, but also as a buffer colony against the Spaniards in Florida and the French in Louisiana.

In the spring of 1733, General Oglethorpe with about 150 followers sailed up the Savannah River to Yamacraw Bluff, where he built Fort Savannah and founded the colony of Georgia, the last of the 13 colonies established by England. Soon afterwards they were joined by bands of Protestant refugees, notably the Moravians and the Salzburgers. Settlements were made at New Ebenezer, New Inverness, Frederica, and Augusta. Oglethorpe, who had gone back to Eng-

land in 1734, returned in 1736 with more colonists, and he also brought 150 Scottish Highlanders, trained soldiers, as well as cannon, for he feared that the claims of the colony would be disputed. With him, too, came John and Charles Wesley, the former as a missionary to the colonists and the Indians, and the latter as secretary to Oglethorpe. George Whitefield the famous English evangelist, joined them in 1738 to aid the missionary work.

In July 1742 the Spaniards in Florida entered St. Simon's Harbor with 36 vessels and 3,000 men to drive out the settlers. General Oglethorpe, who had less than 1,000 men, saved the colony by a ruse after one of his soldiers deserted to the enemy. The resourceful leader addressed a note to the deserter as if he were a spy. He told him to urge the Spaniards to remain in Georgia three days longer as a British fleet with 2,000 men was on the way to attack St. Augustine. At once, the Spaniards rushed away to save St. Augustine, only to find that they had been outwitted.

Settlers had been given grants of land, to cultivate silkworms and raise hemp, grapes, and olives for England. The colony, however, did not thrive, since the members were not accustomed to the warm climate, and slave labor was at first prohibited. Finally, in hope of saving the colony from financial disaster, the trustees permitted the importing of slaves shortly before the middle of the century.

During these uncertain years, the Indians remained friendly until 1751, when Mary Musgrove, an Indian woman who had acted as an interpreter for General Oglethorpe, marched against Savannah with a large band of Indians to demand the return of certain lands. The uprising was quelled easily by William Stephens, Oglethorpe's immediate successor.

When the trustees surrendered their charter in 1752, the colony became a royal province, and it prospered under the liberal rule of its governors, John Reynolds, Henry Ellis, and James Wright.

During the American Revolution, the people of Georgia played a very generous and conspicuous part, rather because of their sympathy with the northern colonies, than because they themselves were dissatisfied with British rule. During 1778, Georgia became the chief battlefield when the British, after their failure to conquer the northern colonies, tried to establish a footing in the South. The British routed the Americans under Gen. Robert Howe and took possession of Savannah, which became the headquarters of the British army in the South until the end of the war.

Georgia adopted its first state constitution in 1777 and it was the fourth state to ratify the Federal Constitution. Trouble with the Creek and Cherokee Indians, who resented the seizure of their lands, was the pressing problem of the new state. In 1802, Georgia, whose territory then included most of the present states of Alabama and Mississippi, sold to the Federal government all its lands westward from the Chattahoochee to the Mississippi River; and the Federal government promised to settle peaceably all claims of the Indians. Negotiations begun in 1832 were not concluded until 1835, and by 1838 all the Indians had been moved to distant reservations.

Georgia in the Civil War

At the beginning of the secession movement, Georgia was divided between Unionists, headed by the able Alexander H. Stephens, and those who wished to leave the Union. When Lincoln was elected president, the state voted overwhelmingly in favor of secession, Jan. 19, 1861, and declared itself a free republic. In 1863, it was the scene of the hard fought

battle of Chickamauga near the Tennessee border. In 1864 General Sherman cut his way across Georgia, captured Atlanta, and then marched to the sea (see Sherman, Gen. William Tecumseh).

After peace came, Georgia recovered slowly from the ravages of the war, which had exhausted more than three-fourths of the state's wealth (see Civil War). In 1865 a new state constitution was adopted. The ordinance of secession was repealed, the war debt was canceled, slavery was abolished, and Georgia was readmitted into the Union, July 15, 1870. In restoring good feeling between North and South, one of the most prominent workers was Henry W. Grady, a popular orator and

A GLIMPSE OF LUXURIANT GEORGIA VEGETATION



This view, taken on a large estate near Brunswick, shows characteristic vegetation along the coast of Georgia. Note the oaks in the foreground, bearded with Spanish moss, and the grass-filled savanna in the middle distance, on each side of the meandering river.

journalist of Atlanta, who labored untiringly for the advancement of the "New South."

GEORGIA. For more than 2,000 years, proud, courageous Georgia, also called Sakartvelo, maintained its own line of kings. Then in 1801 it was annexed to Russia, to which it had appealed for protection from the Turks; but in May 1918, after the Russian revolution, it again declared its independence. In 1922, with Azerbaijan and Armenia, it formed the Transcaucasian Socialist Federative Soviet Republic. When this was abolished in 1936, it became a constituent republic (Georgian Soviet Socialist Republic) of the Soviet Union. The Georgians are a handsome people of ancient white stock (see Caucasus Mountains).

Georgia lies on the Asiatic side of the Caucasus Mountains, bordering on the Black Sea. The capital is the ancient city of Tiflis (Tbilisi), with a population of about 520,000. Here stand many factories and important schools, notably the state university. The oil pipe lines and the railroad from Baku to Batum, chief port of Georgia, pass through Tiflis.

Georgia leads the world in production of high-grade manganese ore. It also mines coal, iron, and copper. Its important farm products are corn and other cereals, cotton, fruit, tobacco, and tea. Cattle are fattened in its rich meadows, and silkworms in its mulberry plantations. Fine timber is cut from the forests. Power for industry comes from hydroelectric plants on the Kura River. Area of Georgia, about 27,000 square miles; population, about 3,545,000.

GERANIUM. Botanists tell us that the red, white, or pink "geranium" plants whose spicy fragrance scents summer gardens and window-sills really are not geraniums at all; they are pelargoniums. But real geraniums are found all over our woods and thickets—graceful wild flowers that often look like wild roses, swinging their five-petaled heads on long hairy stems. We call them crane's-bills or wild geraniums. The spotted crane's-bill is about two feet high and each of its numerous branches bears two light purple flowers about an inch across. Its bitter root-stock is used as a medicine. Another common species is Herb Robert, a plant with dainty little light purple flowers streaked with red, found in damp shady woods and ravines.

The house plants we call "geraniums"—the pelar-

goniums—belong to the same family but differ greatly from the true geranium in appearance. They are much prized for their large, irregular, variously colored flowers and their leaves that vary so in shape, texture, and marking. Geranium oil, a substitute for attar of roses, is distilled from certain species growing in Algeria and in Cape of Good Hope, where most of the plants of this genus have come from.

Both the geranium and the pelargonium belong to the plant family *Geraniaceae*. The geraniums number about 160 species, and are dispersed throughout the temperate regions of the world. The pelargoniums—the commonest of whose 200 species are the cultivated ivy geranium (*Pelargonium peltatum*), the rose geranium (*Pelargonium graveolens*), and the nutmeg geranium (*Pelargonium odoratissimum*)—are perennial herbs or shrubs.

The Language of LUTHER, GOETHE, and SCHILLER

GERMAN LANGUAGE AND LITERATURE. Rough and guttural though German may be, it somehow lends itself naturally to poetry. While German prose is often inclined to do anything but come "trippingly on the tongue," the best German verses are true music. They are alive with sincerity, they speak directly and unmistakably to the human soul, they strike deep to the very elements of life. And much of this wild-flower charm is apparently due to the vital quality of the language itself.

When we first meet with the Germans, or Teutons, about the beginning of the Christian era, they form three distinct groups with corresponding tongues—the East Germanic or Gothic, the North Germanic or Scandinavian, and the West Germanic, from which originated primitive German, English, Dutch, etc. This primitive German continued to split up into dialects as the tribes settled permanently in various districts; but the chief dialects were the High German of the mountainous region of central and southern Germany, and the Low German of the lowland country in the north. High German won out over the dialect of the plains, and it is High German which is the official and literary language of Germany today.

German is really a simple and direct language, although it may present a formidable appearance to the beginner. The first difficulty lies in the old "Gothic" characters, in which most German books are printed. This alpha-

bet is simply a variation of the Roman, and any word written in the former can be reproduced letter for letter in the latter script. Next, the beginner is struck by the enormous length of many German words.

But these are due to the ease with which compounds are formed, and when such words are split up into their several parts, they prove not only easy to understand but have a remarkable gift of expression. Thus, the word "Volksschullehrerseminar" looks almost hopeless with its 23 letters, until we divide it thus: "Volks-schul-lehrer-seminar." Then we discover by translating it bit by bit that it means "public-school-teachers' seminary," or, in other words, a training college for elementary teachers.

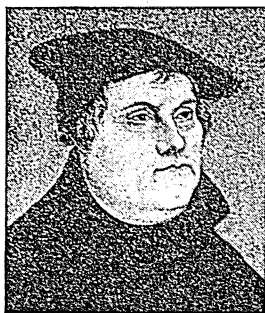
The formation of such compounds gives an exactness of meaning which is often lost in looser English phrases.

And when we add to this the practice, so common in German syntax, of reserving the verb or part of the verb for the end of the sentence, thus holding the reader's attention suspended until the *whole* of the thought has been expressed, we realize why German is so valuable a language for scientific descriptions of all sorts.

The Roman historian Tacitus, writing in the year 98 A.D., tells us that already the German barbarians of that period had a poetry of their own.

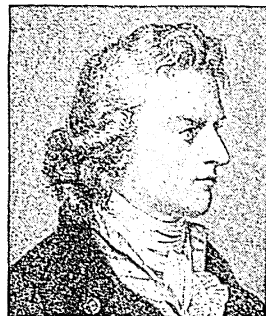
The warriors would advance to battle, he says, singing hymns to Thor, the god of thunder, their shields held before their mouths to clang out a greater volume

MARTIN LUTHER



His Translation of the Bible
Fixed the Standard of
German Prose.

SCHILLER



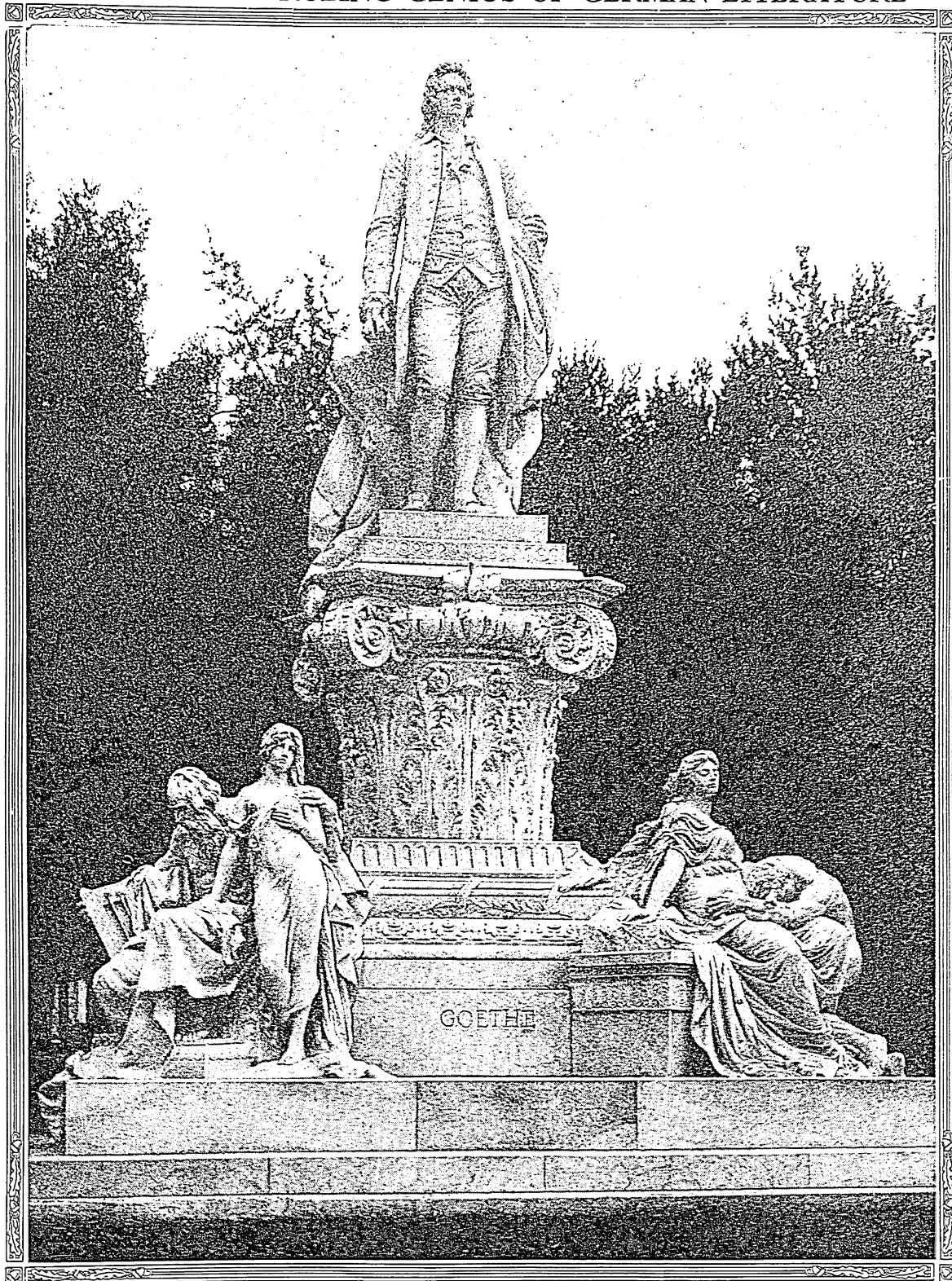
Lyric Poet, Dramatist, and
Friend of Freedom.

HEINE



A Sparkling Poet and Master
of Wit and Irony.

GOETHE — THE RULING GENIUS OF GERMAN LITERATURE



This striking statue of the great poet, dramatist, and philosopher—Johann Wolfgang Goethe—stands in the gardens of the Borghese Villa in Rome to commemorate Goethe's stay in Italy, during which he absorbed so much of the classic spirit. Physically Goethe recalled the Greek ideal of manly beauty—a powerful and symmetrical frame and features cast in heroic mold. On the mental side the resemblance was no less marked. He seemed instinctively attracted by the calm and majestic beauty of the classical spirit as reflected in literature and art. This feeling grew during his Italian visit and profoundly influenced his later works.

of sound. And ever since, no matter what refinements or complexities have developed in German literature, there still remains in it this martial clang of shields, the distant thunder of tribal religion, a hard sonorous music, larger and louder than life. Even the sweetest of their folksongs have something at once vigorous and dark running through them.

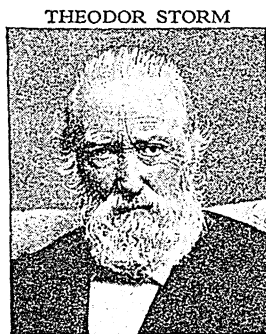
For a long time this ancient poetry remained unwritten, or, if fragments of it were carved now and then in the old Runic alphabet on wooden staffs and metal tablets, it was soon lost, or at best remained but fragments.

Not until the 4th century do we find a book written in a Teutonic tongue, and by that time it treated not of the god Thor, but of Christianity. This book was a translation of the Bible made by Ulfilas, the native missionary to the Goths. In order to make his translation, Ulfilas was obliged first to invent the Gothic alphabet, combining Greek, Latin, and Runic letters to do so. The tongue of those ancient Goths, as we here find it, possessed much of the rolling beauty and expressive roughness of the German language today.

But though Ulfilas began the conversion of the Germans to the Christian religion, their poets continued for centuries to sing of the old gods, of Brunhild and Gudrun, and the flying Valkyrs, as well as of mighty historic figures such as Attila (Etzel) the Hun. The 'Nibelungenlied' of the 13th century is the most famous of these wild old dreams of gods and heroes, and it has been the source of much modern German literature, like a great changeless lake of rugged

beauty from which trickle delicate but more transient streams.

A lighter note, however, tinkled along beside these resounding epics, the music of the "minnesongs," or love lyrics of knighthood. These dwindled out finally in the wholly mechanical "mastersongs," composed by rule and turned out like factory goods. Yet the same period (15th and 16th centuries) in which



THEODOR STORM
Author of the Prose Idyl
'Immensee'.

these stiff and dreary mastersongs were being manufactured was the very heyday of the delightful German "folksongs"—simple abiding music, by poets whose names are unknown.

About this time also German prose began to develop and also German drama, chiefly in the hands of the clergy. Church plays grew into great and solemn spectacles, of which the celebrated Passion Play of Oberammergau is an impressive survival. And when the Reformation came in the church, religion found

even more beautiful expression in the fine old hymns of Martin Luther. But it was Luther's translation of the Bible which had the most important effect. This did for the German language what the works of Dante, Petrarch, and Boccaccio did for Italian, or what the King James Bible did for English. It fixed the standard of the language in the midst of a confusion of dialects. Modern German dates largely from Luther's works.

As the years went on, religious disputes became angrier; the Thirty Years' War (1618-1648) broke out, and the light of literature vanished in its horrors. National feeling decayed, and a weak and war-worn generation mimicked French thought and customs in almost every field. Great literature does not come by imitation.

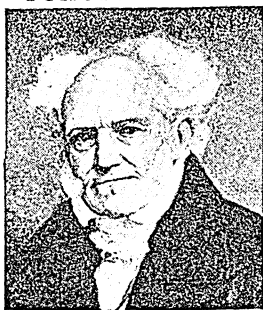
Therefore it was not until the time of Frederick the Great that German literature flourished again. To be sure, this king of Prussia was contemptuous enough of the national literature; he preferred to copy the French style of writing and honored French authors, notably Voltaire, far more than he did the oncoming German writers. But Frederick raised Germany from the dust, and gave to German genius a sense of pride and independence which permitted it to break with French and English models—in spite of Frederick himself—and create beauty out of its own substance. Thus Frederick's reign (1748-1786) ushered in the "great century of German literature."

In this century glow the names of Klopstock, Lessing, Wieland, Goethe, Schiller, Richter, the brothers Grimm, Fouqué, von Kleist, Heine, and many more. Under the influence of English and French philosophers, such as Locke and Voltaire, whose views Frederick broadly championed, the Germans were prodded into new paths, and new thoughts began to travel in men's minds.

To Klopstock goes the honor of molding a new poetic language. Lessing, the first of the great German classic authors, is the master of style, the foremost German critic, who preached the harmony of content and form and banished the long gusty pages of description and high-soaring allegory. Wieland, epic poet and novelist, pioneered the way for free expression of emotion, and edged in a new and neater wit.

Then came the influence of Rousseau, the little Swiss who set France on her fateful way to the Revolution. Aided largely by the work of Herder, this

SCHOPENHAUER



A Philosopher who Preached
a Doctrine of Pessimism.

NIETZSCHE



Author of the Famous Doc-
trine of the "Superman."

influence produced in Germany what is termed the "storm and stress" movement. People began to talk of the perfect freedom of the individual, and to rebel at tradition and authority. Politically the movement came to nothing in Germany, but in literature the effect was enormous. The great Goethe, bearer of the brightest name in German literature, shared in the movement, and likewise Schiller, his shining contemporary. The "storm and stress" grew rapidly into the rankest sentimentalism, a sad twilight mood in which it became fashionable to revel in misery.

But presently came the sobering effect of the philosopher Immanuel Kant, with his stern doctrine of duty, followed by Goethe's swing back toward classicism and order as the result of Italian influences. Thus this balloon of sentiment was punctured. Perhaps the laughing irony of Jean Paul Richter's novels also had something to do with sweeping away the last bits of the "storm and stress."

Romanticism and Individualism

However, something very similar to the "storm and stress" again developed during the Romantic period which followed. This was partly due to the philosophical theories of Johann Gottlieb Fichte and of Friedrich von Schelling. The latter proposed the imagination for as good a guide in life as the intellect. The Romantics were individualists, obscure and capricious; but on the other hand they freed the wings of poetry, unveiled the beauties of folklore, and opened long vistas of foreign thought before the provincial German mind. And above all, from them came Heinrich Heine, the greatest lyric poet since Goethe, master of wit and irony, poet of the sea, artist of exquisite moods and of light crystalline style.

Heine lived in the years of Germany's losing struggle against the rise of absolute monarchy. In 1848 the sword drawn for German freedom was defeated by Prussian absolutism; but the defeat politically of this so-called "young German" movement could not destroy the new spirit of freedom. The pessimistic philosophy of Schopenhauer appealed to people with new force, and advances in science tended to bring a materialistic attitude to life.

In literature men turned from the "moon-lit magic nights" of the Romanticists to the clearer light of day. Observation and objectivity replaced feeling and subjectivity. Two dramatists, Friedrich Hebbel and Otto Ludwig, were pathmakers in this more realistic style. Richard Wagner sought a closer union between drama and music in his operas. Many novelists, as Alexis and Meyer, followed Walter Scott in writing historical novels. Others wrote of peasant and village life. Outstanding names here are: Auerbach, Freytag, Heyse, Raabe, Storm, Keller, Fontane, and Fritz Reuter.

In the last decades of the 19th century the displacement of human labor by machinery, industrialism, and life in the big city meant poverty and suffering to many people. There was conflict in the thought of the time. On the one hand Nietzsche was

expressing his doctrine of the value of the individual and the coming of the superman. On the other hand men were studying social conditions and trying to make life less hard for the lower classes of society. At the same time impulses to a new movement in literature called Naturalism came to Germany from Scandinavia, France, and Russia through Ibsen, Zola, and Tolstoy.

Naturalism and the New Drama

Naturalism emphasized the minute description of environment, and the portrayal of the ugly rather than the beautiful. An association, *die freie Bühne* (the free stage) was formed by a group of dramatic critics to further the performance of the new type of plays. The performance of Hauptmann's 'Vor Sonnenaufgang' (Before Sunrise) in 1889 marked a new era in German drama. He wrote many other naturalistic plays and at a later period the symbolistic play, 'The Sunken Bell'. Sudermann won popular favor at home and abroad by many novels and dramas, but was rather a skilful playwright than a great dramatist. Liliencron, an army officer, put into poetry the everyday experiences of his own life in new and changing meters.

Naturalism with its emphasis largely upon outward conditions and upon the sordid and ugly could not long satisfy the German mind. Thus almost concurrent with Naturalism came the movement known as Impressionism. It implied an emphasis again upon the *ich*, the personal, the soul; but with keener psychological analysis than in Romanticism. The novelists Gustav Frenssen, Clara Viebig, and Helene Böhlau described their native towns and districts in a naturalistic way, with impressionistic touches that distinguished their stories from the older type of village tale. In the impressionistic drama Wildenbruch and especially the Austrian Schnitzler were leaders.

The so-called new Romantic movement was also opposed to Naturalism. Hugo von Hofmannsthal wrote lyrical dramatic pieces full of musical charm and Ricarda Huch wrote important critical works and developed further the historical novel. Classical tendencies also appeared. The aristocratic Stefan George in his lyrics emphasized form. Richard Dehmel sought a harmony of spirit and of form in his lyrics. The theme of his poetry was the individual in his relation to society, "*ich, im All zum All.*" Thomas Mann and Heinrich Mann in their novels sought a solution of the same social problems.

These tendencies to consider the good of society as a whole as against the individualism of Nietzsche's philosophy grew stronger from the 90's on. Philosophers thought of the individual in his relation to the universal and the absolute. A new attitude to religion was awakened, especially after the World War. In the schools the Youth Movement arose. This changing attitude in philosophy and religion is reflected in literature after about 1910. In literature the movement is called Expressionism. The

Expressionists seek a new style and technique in the drama, and new forms in lyric poetry. In the latter the influence of Walt Whitman and Verhaeren is evident. Many dramas of Ernst Toller are based on experiences in the World War. Georg Kaiser in compact dramas gives cross-sections of present social conditions. To the lyric poet of today, God and the soul are realities, and he seeks an expression of these

realities in terms not merely of personal experience, but in terms of the typical and the universal. The reflective poet Franz Werfel and the mystical metaphysical poet Rainer Maria Rilke are outstanding names in the poetry of today. Fritz von Unruh, in his lyrics and dramas, seeks to solve the meaning of human existence. He urges brotherhood and decries war.

Chief Figures in German Literature

Ulflas (311?-383?)—Translation of Bible into Gothic.
Walther von der Vogelweide (1165?-1230?), minnesinger; national poet of Middle Ages.
Wolfram von Eschenbach (1170-1220), poet of knighthood—'Parzival'; 'Titurel'.
Martin Luther (1483-1546)—Translation of the Bible; hymns.
Hans Sachs (1494-1576), mastersinger and dramatist—'Fastnachtsspiele' (Shrovetide Plays).
Friedrich Gottlieb Klopstock (1724-1803), classical poet—'Der Messias' (The Messiah); odes.
Gotthold Ephraim Lessing (1729-1781), critic and dramatist—'Emilia Galotti'; 'Minna von Barnhelm'; 'Laokoön'.
Christoph Martin Wieland (1733-1813), novelist and poet—'Der goldene Spiegel' (The Golden Mirror); 'Agathon'.
Johann Gottfried von Herder (1744-1803), critic—'Kritische Wälder' (Critical Forests); 'Ideen zur Philosophie der Geschichte' (The Philosophy of History).
Johann Wolfgang Goethe (1749-1832), poet, critic, dramatist, and novelist—'Die Leiden des jungen Werthers' (The Sorrows of Young Werther); 'Wilhelm Meister'; 'Faust'; 'Hermann und Dorothea'.
Johann Christoph Friedrich Schiller (1759-1805), poet and dramatist—'Das Lied von der Glocke' (The Song of the Bell); 'Wallenstein'; 'Maria Stuart'; 'Die Jungfrau von Orleans' (The Maid of Orleans); 'Wilhelm Tell'.
Johann Paul Friedrich Richter ('Jean Paul') (1763-1825), humorous novelist—'Quintus Fixlein'; 'Siebenkäs'; 'Flegeljahre' (Wild Oats).
Friedrich de la Motte Fouqué (1777-1843), poet and novelist—'Undine'; 'Theodolf, the Iclander'.
Heinrich von Kleist (1777-1811), dramatist and poet—'Penthesilea'; 'Der zerbrochene Krug' (The Broken Pitcher).
Jakob (1785-1863) and Wilhelm (1786-1859) Grimm—'Fairy Tales'.
Arthur Schopenhauer (1788-1860), philosopher—'Die Welt als Wille und Vorstellung' (The World as Will and Idea).
Franz Grillparzer (1791-1872), Austrian dramatist—'Sappho'; 'Das goldene Vlies' (The Golden Fleece).
Heinrich Heine (1797-1856), poet—'Die Lorelei' and many other poems; 'Reisebilder' (Travel Pictures).
Wilibald Alexis (G. W. H. Häring) (1798-1871), novelist—'Der falsche Waldemar'; 'Roland von Berlin'.
August Heinrich Hoffmann ('Hoffmann von Fallersleben') (1798-1874), poet and song writer—'Deutschland, Deutschland über alles'.
Fritz Reuter (1810-1874), novelist—'Ut mine Stromtid' (From My Peasant Days).
Berthold Auerbach (1812-1882), novelist—'Schwarzwälder Dörfgeschichten' (Black Forest Village Stories).
Friedrich Hebbel (1813-1863), poet and dramatist—'Judith'; 'Herodes und Marianne'; 'Agnes Bernauer'.
Otto Ludwig (1813-1865), dramatist and novelist—'Der Erbförster' (The Hereditary Forester); 'Zwischen Himmel und Erde' (Between Heaven and Earth).
Richard Wagner (1813-1883), writer of operas—'Lohengrin'; 'Tannhäuser'; 'Der Ring des Nibelungen'; 'Tristan und Isolde'; 'Die Meistersinger'; 'Parsifal'.
Gustav Freytag (1816-1895), novelist and dramatist—'Die Journalisten' (The Journalists); 'Soll und Haben' (Debit and Credit).
Theodor Storm (1817-1888), poet, novelist, and short story writer—'Immensee'.
Gottfried Keller (1819-1890), poet, novelist, and short story writer—'Der grüne Heinrich' (Green Henry); 'Die Leute von Seldwyla' (Seldwyla Folk).
Theodor Fontane (1819-1898), poet and novelist—lyric poems and ballads; 'Effi Briest'.
Conrad Ferdinand Meyer (1825-1898), Swiss poet and novelist—'Jürg Jenatsch'; 'Der Heilige' (The Saint).

Paul Heyse (1830-1914), poet, dramatist, novelist, and short story writer—'L'Arrabbiata'; 'Kinder der Welt' (Children of the World); 'Im Paradiese' (In Paradise).
Wilhelm Raabe (1831-1910), novelist—'Cristoph Pechlin'; 'Horacker'.
Friedrich Nietzsche (1844-1900), philosopher and essayist—'Jenseits von Gut und Böse' (Beyond Good and Evil); 'Also sprach Zarathustra' (So Spake Zarathustra).
Detlev von Liliencron (1844-1909), poet—lyric poems.
Ernst von Wildenbruch (1845-1909), poet, dramatist, short story writer—'Die Karolinger' (The Carolingians); 'Quit-zows'; lyrics, ballads, short stories.
Karl Spitteler (1845-1924), Swiss epic poet and novelist—'Der olympische Frühling' (The Spring of Olympus).
Hermann Sudermann (1857-1928), dramatist and novelist—'Es lebe das Leben' (The Joy of Living); 'Heimat' (translated as Magda); 'Frau Sorge' (Dame Care); 'Die Ehre' (Honor).
Helene Böhlau (1859-), novelist and short story writer—'Halbtier' (Half Animal); 'Ratsnadelgeschichten' (Stories to Councilor's Daughters).
Clara Viebig (1860-), novelist—'Das tägliche Brod' (Daily Bread); 'Das schlafende Heer' (The Sleeping Army).
Gerhart Hauptmann (1862-), dramatist—'Die Weber' (The Weavers); 'Die versunkene Glocke' (The Sunken Bell); 'Hannele'.
Arthur Schnitzler (1862-1931), Austrian dramatist and novelist—'Anatol'; 'None but the Brave'; 'The Lonely Way'.
Gustav Frenssen (1863-), novelist—'Jörn Uhl'.
Richard Dehmel (1863-1920), poet and dramatist—'Michel Michael'; lyric poems.
Frank Wedekind (1864-1918), dramatist—'Frühlings Erwachen' (The Awakening of Spring).
Ricarda Huch (1864-), novelist and poet—'Defeat'; 'Victory'; 'The Deruga Trial'.
Stefan George (1868-1933), poet—'Das Jahr der Seele' (The Year of the Soul); 'Die Lieder von Traum und Tod' (Songs of Dreams and Death).
Heinrich Mann (1871-), novelist—'Die Armen' (The Poor); 'Mutter Marie' (Mother Mary).
Jakob Wassermann (1873-1934), novelist—'The World's Illusion'; 'Caspar Hauser'; 'The Maurizius Case'.
Hugo von Hofmannsthal (1874-1929), Austrian dramatist—'Elektra'.
Thomas Mann (1875-), novelist—'Die Buddenbrooks'; 'Der Zauberberg' (The Magic Mountain); 'Der Tod in Venedig' (Death in Venice).
Rainer Maria Rilke (1875-1926), poet—lyric poems.
Georg Kaiser (1878-), dramatist—'Gas'; 'Von Morgens bis Mitternachts' (From Morn to Midnight); 'Mississippi'.
Fritz von Unruh (1885-), dramatist, poet, and novelist—'Ein Geschlecht' (Of one Race); 'Heinrich aus Ander-nach'; 'Opfergang' (The Way of Sacrifice).
Arnold Zweig (1887-), novelist—'The Case of Sergeant Grischka'.
Paul Kornfeld (1889-), dramatist—'The Seduction'.
Walter Hasenclever (1890-1941), dramatist—'Beyond'; 'The Son'.
Franz Werfel (1890-), Austrian novelist, poet, and dramatist—'Einander' (One Another); 'Der Spiegel-mensch' (Reflected Humanity); 'Class Reunion'; 'The Pure in Heart'; 'The Forty Days of Musa Dagh'.
Ernst Toller (1893-1939), poet, dramatist—'Masse-mensch' (Man and the Masses); 'Die Maschinenstürmer' (The Machine Wreckers); 'Die Wandlung' (Transition).
Erich Maria Remarque (1898-), novelist—'All Quiet on the Western Front'; 'The Road Back'.

The GERMAN LAND and Its PEOPLE

Extent.—North to south, about 580 miles; east to west, from 370 to 730 miles (excluding Polish lands). Area of Germany proper, about 226,100 square miles; population, 79,730,000. Area of Greater Reich (including protectorates of Bohemia and Moravia, and Slovakia), about 260,000 square miles; population, 89,200,000. (These figures do not include the areas annexed or occupied by Germany during the second World War.)

Rivers.—Danube (Inn, Morava, tributaries), Rhine (Mosel, Neckar, Main, Ruhr, tributaries), Ems, Weser, Elbe (Moldau, Saale, tributaries), Oder, and Vistula.

Mountains.—Austrian and Bavarian Alps, Bohemian Forest, Erzgebirge, Sudetes, western Carpathians, Black Forest, Thuringian Forest, Taunus, and Harz Mountains.

Products.—Iron and steel manufactures, textiles (cotton, woolen, linen, silk), beet sugar, chemicals, electrical goods, pottery, wine and beer; wheat, rye, oats, barley, potatoes, timber, live stock, and dairy products; herring and other fish, coal and lignite, iron, zinc, salt, lead, copper, potash.

States (in order of area).—Prussia, Ostmark, Bavaria, Sudetenland, Württemberg, Mecklenburg, Baden, Saxony, Thuringia, Hesse, Oldenburg, Brunswick, Anhalt, Saarland, Lippe, Hamburg, Schaumburg-Lippe, and Bremen.

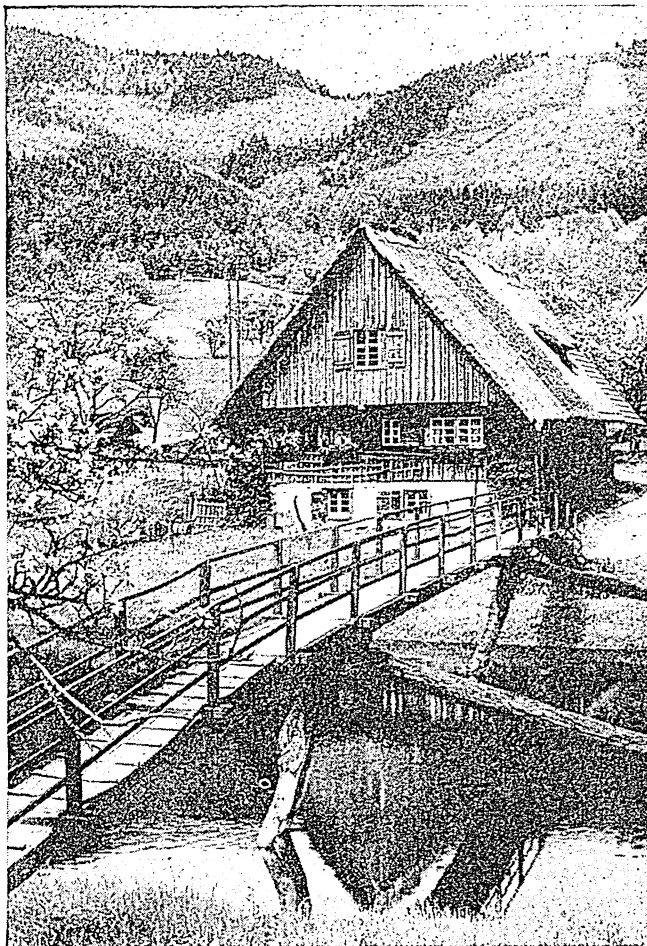
Chief Cities (Germany proper).—Berlin (capital, over 4,000,000); Vienna and Hamburg (over 1,500,000); Munich, Cologne, Leipzig, Essen, Dresden, Breslau, Frankfurt-on-the-Main, Stuttgart, Düsseldorf, Dortmund (over 500,000); Hanover, Duisburg-Hamborn, Nuremberg, Wuppertal, Bremen, Königsberg, Chemnitz, Magdeburg, Gelsenkirchen, Bochum (over 300,000).

GERMANY. No country in modern times has been through more amazing ups and downs than Germany. In 1871 Bismarck forged its many separate states into the mighty German Empire. Until 1914, this empire dominated continental Europe. Then in 1918 it lost the World War and crashed—helpless and starving. After 15 years of patient struggle to regain prosperity, Germany accepted Adolf Hitler as dictator and within five years was again a dominant power. Demanding *Lebensraum* (living room) for the German people, and the annexation of territories inhabited by people of German blood, Hitler in 1938 and 1939 seized Austria and most of Czechoslovakia. In September 1939 he went on to take Danzig and invade Poland, thereby bringing on another conflict with France and Great Britain and once more staking the nation's fate on the hazards of war. He had added nearly 40 million people and 150,000 square miles of land to the Reich; but whether they would remain German depended on the issue of the war.

Shape and Character of the Land

This mighty realm extends across central Europe from the North Sea and the Baltic to Switzerland, Italy, Yugoslavia, and Hungary. The map on the following page shows how its western and southern borders form a fairly even semicircle. But before the conquest and partition of Poland, the eastern borders jutted out like two great jaws with Poland between them. The upper jaw was broken by the Polish Corridor, which separated East Prussia from the rest of Germany and gave Poland its only access to the sea.

The entire southern border rests upon the Alps. Their northern slopes are drained by the Danube, flowing east. Then comes a jumble of old, immensely



This is a typical peasant's cottage in the Black Forest of southern Germany. The first story, built of stone, probably houses cows and horses. The family lives above, in spotlessly clean rooms.

worn-down mountain ranges. North of them the land slopes off gently, and becomes the North German Plain.

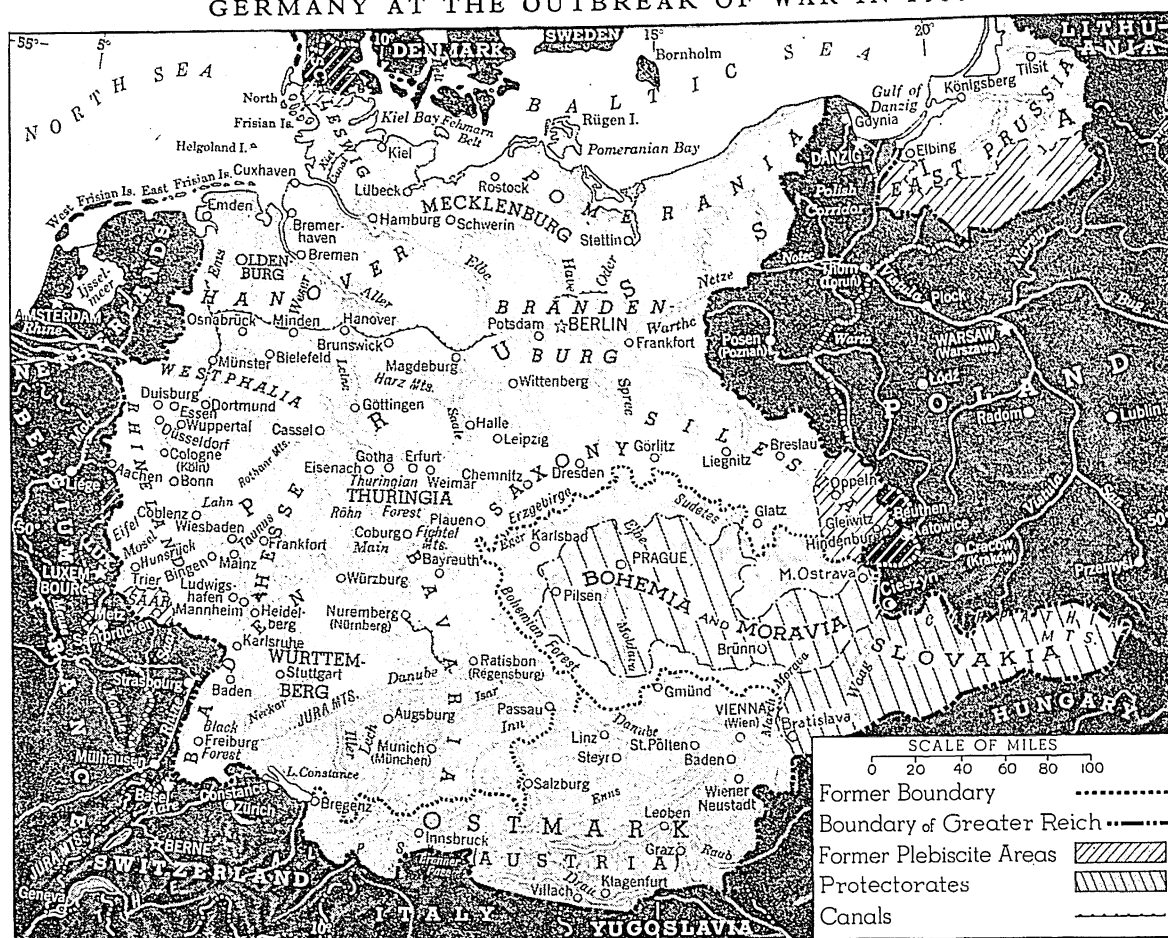
The climate ranges from oceanic in the west to continental in the east (*see* Climate). Only in the mountains is precipitation much more than 30 inches a year. Winter mean temperatures range from about 33° F. in the west to 26° in the east. Summer averages are from about 70° in the south to 64° in the north.

Germany's Great System of Rivers

All important German rivers, other than the Danube, drain north from the mountains to the sea. From west to east they are the Rhine, the Ems, the Weser, the Elbe, and the Oder. The Vistula (Weichsel) drains the heart of Poland. These rivers, their tributaries, and the canals which link them carry an enormous commerce. Each has a seaport at or near its mouth, and all are navigable far into Germany for barges and small steamers.

By far the busiest of the rivers is the Rhine. It is linked by canal to the Rhone in France, and by the Main and a canal to the Danube. Although its mouth is outside Germany, in the Netherlands, it is the country's

GERMANY AT THE OUTBREAK OF WAR IN 1939



The lines made of single dots, marking the boundary of Germany before the World War of 1914-1918, show that some parts of the old empire were included in France and Poland. But these were more than offset by the gains in the southeast, where former Austria now appears as the province of Ostmark and fragments of what used to be Czechoslovakia form the protectorates of Bohemia and Moravia and of Slovakia, seized by Hitler in 1939. Around Bohemia and Moravia is the Sudeten region, annexed in 1938.

busiest waterway, because it flows through the industrial heart of Europe. (See Rhine River.)

The Peoples of Germany

These rivers, an abundant supply of coal, and a stimulating climate with sufficient rainfall are Nature's principal gifts to Germany; the rest of its power the nation owes to the character of its people. The people of the south derive many traits from the prehistoric Alpine people who entered Europe along the central mountain backbone, bringing knowledge of agriculture and other arts from Asia (see *Races of Mankind*). They like music, solid home comforts, and a good time. The northerners are descended from Nordic nomads, who swept in from Asia along the northern plain; they are the organizers and the fighters of Germany. But the two types are alike in their patience, their painstaking thoroughness, and their disciplined obedience.

The Populous Northern Plain

How the Germans can do much with scanty resources is strikingly demonstrated on the northern plain. This plain was made in the Ice Age by great glaciers which spread out fanwise from Scandinavia over northern

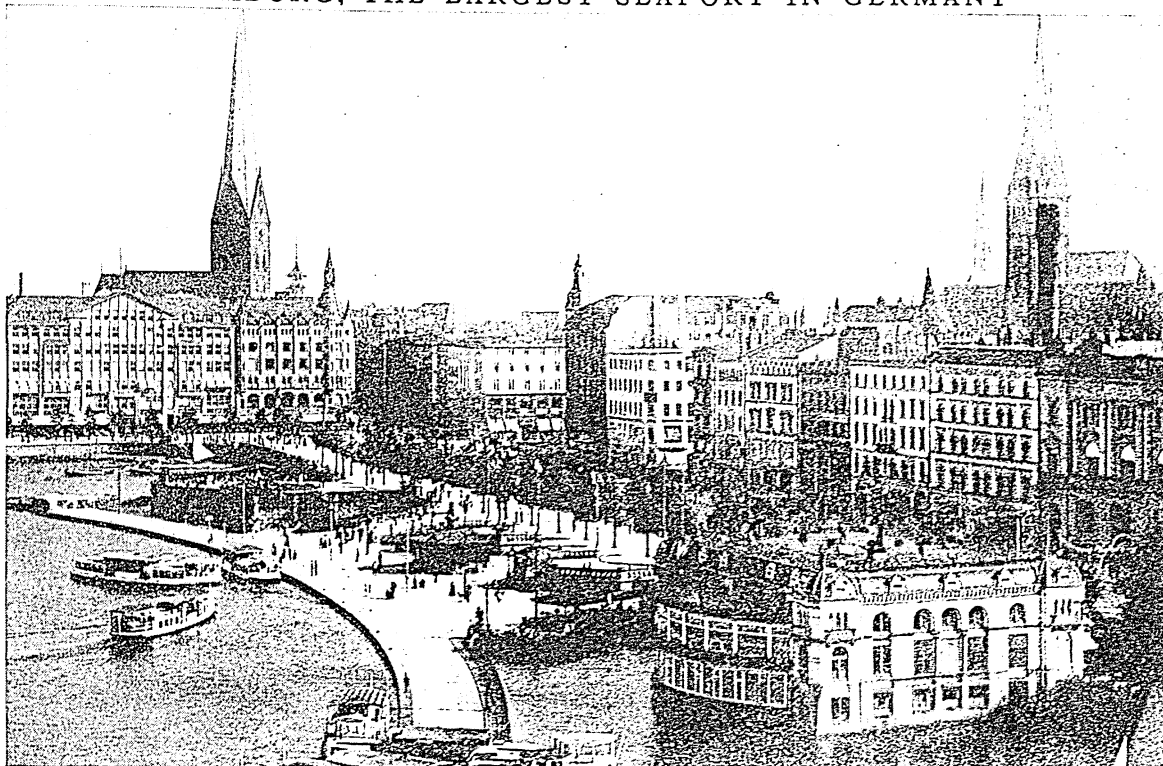
Germany. They planed the land flat, except where they heaped up moraines—ridges of boulders, gravel, and soil—along their edges. As water melted from the edges, it cut flat valleys across the slope of this northern plain, and made natural routes for digging canals.

The soil left by the glaciers is thin and in many places sandy; but the patient Germans, working with scientific thoroughness, make it yield abundantly. Pomerania and other parts of Prussia produce huge crops of rye, barley, oats, sugar beets, and potatoes—especially potatoes, the chief food of many Germans. The town of Offenbach in the Black Forest put up a statue of Sir Walter Raleigh, in the belief that he brought the potato to Europe (see *Potato*). Horses, cattle, sheep, and hogs are abundant.

The seaports of the northern coast are busy centers for fisheries, trade, and shipbuilding. Facing the North Sea are the maritime cities of Bremen and Hamburg (see *Bremen*; *Hamburg*). The naval harbor, Kiel, stands at the Baltic end of the canal across Jutland.

The important eastern port of Danzig, which had been taken from Germany by the Treaty of Versailles,

HAMBURG, THE LARGEST SEAPORT IN GERMANY



This picture shows one of the principal waterfront streets of Hamburg, which is the largest and most important of German seaports and outranks all other European ports except London in the volume of its water-borne trade. Together with the city of Altona, which is continuous with it, it presents a frontage of six miles on the Elbe River, which leads to the sea 75 miles away. Hamburg also straddles the little river Alster. Handsome shops, great hotels, and fine restaurants face upon the water. Small steamers, such as those shown in the picture, are the favorite means of travel between the business center and the outlying suburbs.

was again declared a part of the Reich in 1939 (*see* Danzig). Königsberg is the capital of East Prussia, which was cut off by the Polish Corridor from the rest of Germany until 1939. This old Hanseatic city grew up around a castle built in the 13th century by the Teutonic Knights (*see* Crusades). It was for centuries a seat of Prussian military power. Today it is important for its manufactures of machinery, locomotives, amber products, chemicals, tobacco preparations, pianos, and beer. The remaining north-coast ports, Lübeck and Stettin, were famous in the days of the Hanseatic League, but are of minor importance now. (*See* Prussia.)

Southern Germany—Genial and Picturesque

The more rugged southern half of Germany contains the ancient homes of German culture, the historic regions of Austria (Ostmark), Bavaria, Swabia, and Franconia. Seven hundred years ago, when the original Prussians beyond the Vistula were still heathen Slavs, Franconia and Swabia were great and flourishing duchies, the bases of leading branches of the German folk, from which sprang illustrious lines of emperors. As states they have long since disappeared from the map. Baden, Württemberg, and Hesse occupy today parts of these ancient duchies. (*See also* Austria.)

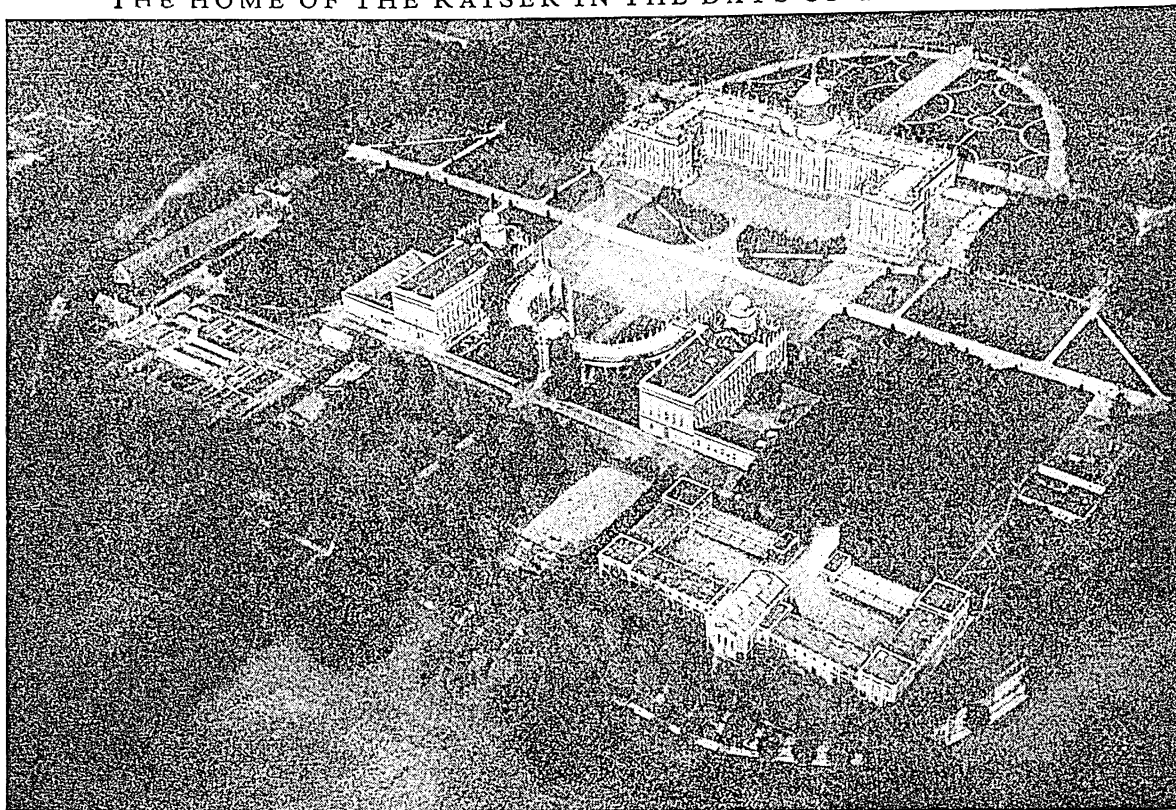
How welcome is the change from the Prussian north to the friendlier and more picturesque land and people

of the south and the southwest! Instead of monotonous level plain, we have fertile valley, wooded upland, and occasional rounded mountains; and everywhere ruined castles, quaint old cities rich in historic and artistic memories, and peasant costumes for men and women gay with color and silver and velvet ornaments. To the agricultural products of the north, we here add wheat, flax, and tobacco. In Bavaria grow the hops which produce the famous German beer, and in the Rhineland are wonderful vineyards. And everywhere we see churches and shrines, for South Germany and the Rhineland are as staunchly Catholic as the north is Protestant.

Across the Rhine in Alsace-Lorraine lies Strasbourg, the famous old city which has changed hands so many times in its long and stirring history. Back on the eastern bank, in the elbow of the Rhine, we come to the former grand duchy of Baden, which is famous alike for its picturesque Black Forest (*see* Black Forest), and for Heidelberg, the seat of a great university and a beautiful ruined castle. The former kingdom of Württemberg, with its castle-crowned, vineyarded hills and rich forest slopes, is filled with memories of old Swabian days; but its capital Stuttgart is a flourishing modern city.

These wooded highlands of the south raise the total of Germany's forest area to one-fourth of the whole

THE HOME OF THE KAISER IN THE DAYS OF THE EMPIRE



We are looking down from an airplane on the royal palace and pleasure grounds formerly occupied by the German emperors at Potsdam, 16 miles from Berlin. The palace stands in the midst of the famous Sans Souci Park. It was completed by Frederick the Great in 1769, and was the summer residence of William II until his downfall. For years the very name "Potsdam" was a synonym the world over for Prussian military autocracy.

land. Beech, oak, pine, spruce, and birch are among the most important growths. The state governments strictly control the forests, even where they are privately owned; and no one may destroy a tree without planting another. Thus the forests are never exhausted, and the evil effects on climate and soil of deforestation are avoided (*see* Forests and Forest Protection). In some parts of Bavaria the wood industries are almost the sole resources of the people. Even on the lordly Rhine great timber rafts are frequently met with floating downstream to Mainz and other furniture-making and wood-using cities.

Bavaria's Beauty and Splendid Cities

In the former kingdom of Bavaria the traveler finds the genial and art-loving spirit of southern Germany still flourishing despite the steady advance of regimented industry and stern Nazi militarism. Here, too, one finds the loveliest of all German scenery. The former Austro-Bavarian boundary runs along the ridge of the Northern Tyrolean or Bavarian Alps, and in the distance are seen the far-off majestic peaks of the Vorarlberg. Thoroughly Alpine are the little Bavarian towns of Garmisch and Mittenwald; and the numerous upland lakes—Chiemsee, Starnberger See, Ammersee, and the rest—are altogether lovely. The Zugspitze (9,738 feet), 57 miles south of Munich, is

the highest peak in Germany. In this Bavarian hill country, also, are unique castles like New Schwanstein and Linderhof, modern built, but medieval in appearance; these were the extravagant work of Bavaria's mad, romantic, unhappy kings, Ludwig and Otto.

Bavaria's cities, too, may well be her pride. The art-loving capital Munich (*see* Munich), on the swift-rolling Isar, has a charm lacking to Berlin. Augsburg, Nuremberg, Regensburg, and Passau, each has an interest all its own. And where can Wagnerian opera be heard so well as at Bayreuth (*see* Wagner, Wilhelm Richard), or religious drama seen to better advantage than at Oberammergau?

Augsburg dates from Roman days, and bears the name of the Emperor Augustus. It is filled with memories of trans-Alpine commerce with Italy in the Middle Ages; and here may still be seen the house, rich with its frescoed exterior, of the Fugger merchant prince who lent enormous sums to the Emperor Charles V. A well-known painting pictures for us the scene when the head of this great banking family astonished the emperor by laying on the fire the promissory notes which Charles had signed, thereby releasing him from the debt. Nuremberg is so important and picturesque that it is described elsewhere.

Forty miles to the west of Nuremberg lies the little

town of Rothenburg-on-the-Tauber, one of the best-preserved medieval cities in existence, with its old city walls and town hall, and its old churches and houses. Every year the city gives a play called 'The Master Draught', which tells the story of how a burgomaster delivered his people from the wrath of General Tilly in the Thirty Years' War—by drinking, without stopping for breath, a tremendous flagon of Rothenburg wine.

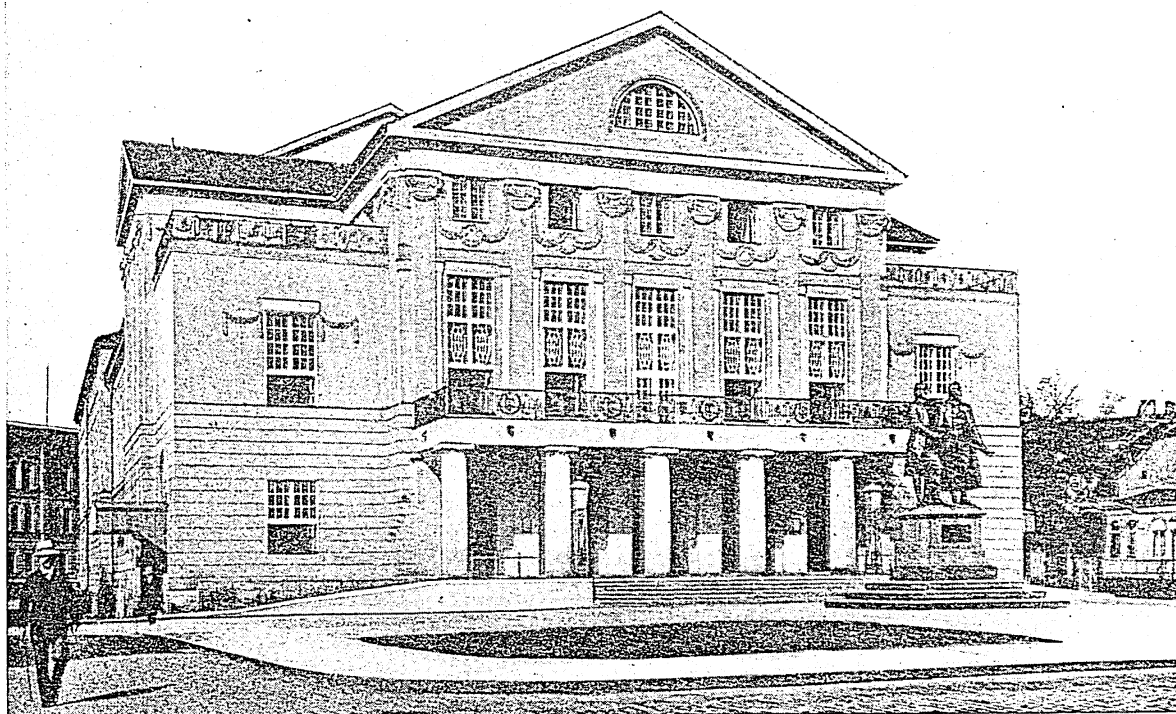
The Central Industrial Regions and Coal

Between these two older Germanys of the north and the south lies the newer Germany, comprising the two

first World War, Germany had to import ore from France and elsewhere, for its own mines supplied only part of its needs. Germany's output of high-grade coal is only about two-thirds as large as Great Britain's; but it makes up for this by using lignite, or brown coal, which is inferior in quality but is successfully used to generate electricity.

Another important mineral resource is potash. The mines at Stassfurt in Prussian Saxony furnish more than half the world supply of this salt, indispensable for fertilizers and many chemicals. Germany also has

GERMANY'S NATIONAL THEATER AT WEIMAR, CITY OF CULTURE



This handsome theater, with its classic architecture, embodies the spirit of Weimar, the Thuringian city famous as a center of German art and liberalism. It was built in 1907 on the site of a theater erected in 1825 under the supervision of Goethe. Many of the plays of Goethe and Schiller, who lived in Weimar, were first performed in the old theater. In memory of that golden age of German drama, a festival week is held each Easter. The statues in front are of Goethe and Schiller. The theater also has modern historical significance, for the German National Convention met there in 1919 and made Germany a republic.

chief industrial regions. The eastern manufacturing area starts in Silesia, and includes Saxony and the regions acquired from Czechoslovakia in 1938 and Poland in 1939. In the west is the Rhine-Westphalian district, on both sides of the Rhine north of Cologne. The manufactures of Berlin and other large cities are of minor importance compared with those of the two great industrial regions.

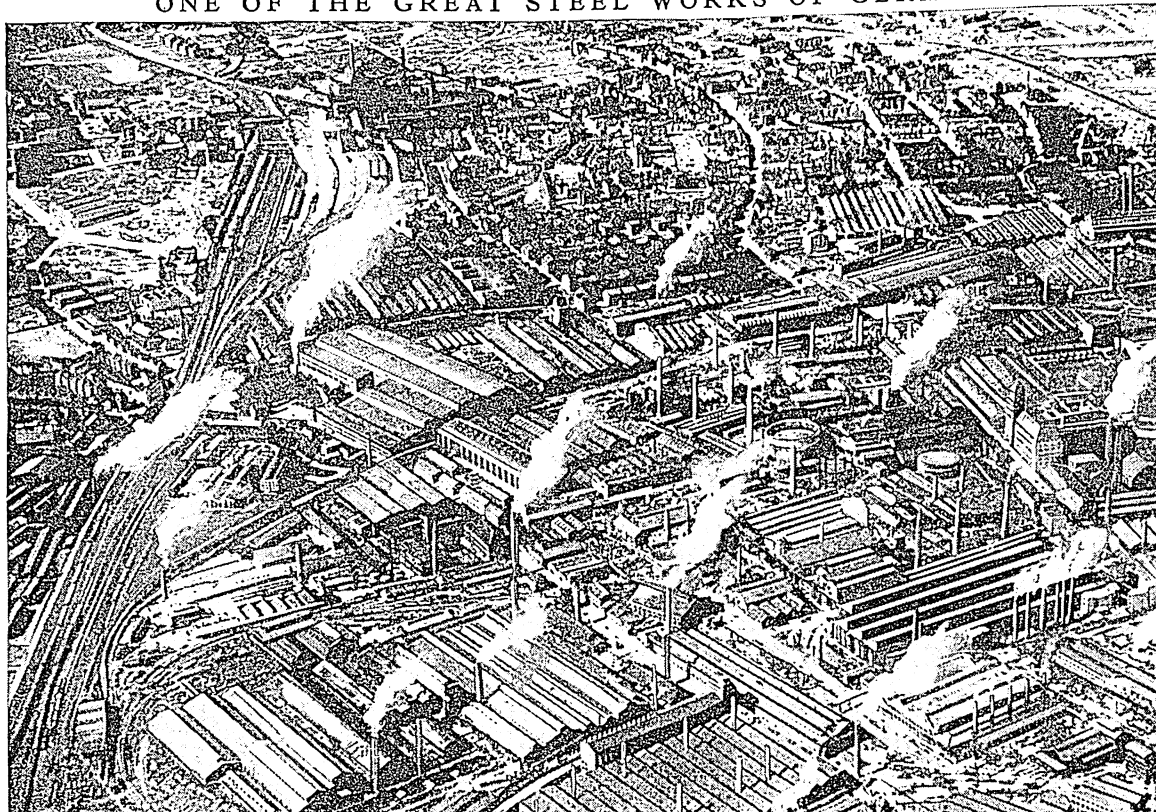
Coal and good transportation are the bases which chiefly support these manufacturing areas. The Ruhr Valley in the west has the largest supply of good coking coal in Europe. From 1871 to 1918 Germany had the iron of Lorraine, and with this iron and with the Ruhr coal it built up a great iron and steel industry. After France regained Lorraine as a result of the

some zinc, copper, lead, salt, and silver; and in 1938, its mineral resources were enriched by its gains from Czechoslovakia. These gains included lignite, iron, kaolin for china, and glass materials.

Chief Industrial Cities

Prominent among the Westphalian industries are the huge Krupp works at Essen, the seat of Germany's manufacture of cannon, munitions, and armor plate, as well as locomotives, ship engines, and other heavy steel products. Solingen is renowned for knives and cutlery, Iserlohn for needles. The cotton manufacturing city of Wuppertal is called "the German Manchester"; it includes the former twin cities of Barmen and Elberfeld. Krefeld is the chief seat of silk and ribbon manufacture; Düsseldorf is the banking center.

ONE OF THE GREAT STEEL WORKS OF GERMANY



The great Krupp steel works at Essen are among the largest in the world. The Versailles Treaty forbade them to make any more guns or munitions, and only American intervention prevented them from being completely destroyed. But after 1934 many of the shops, which had been turned from making turret-guns to making Diesel engines, and from howitzers to motor trucks, began once again manufacturing instruments of war as part of Germany's great rearmament program. Here also are made many peace-time products.

The industrial district of Saxony is similarly based on the Saxon coal field. From Chemnitz and Zwickau come German stockings, knit underwear, and other goods made from imported cotton. Fine wools grown in Saxony and Silesia made these regions great centers also for woolen textiles. The clay deposits at Meissen, near the Saxon capital Dresden (see Dresden), made possible the famous "Dresden ware." Many of the chemical, dyestuffs, and electrical industries are located in this region. Leipzig, seat of a great university, is also one of the greatest book-publishing centers in existence (see Leipzig).

How Germany Built for Greatness

Most of this industrial strength was developed after 1870, aided largely by three factors. First was Germany's natural advantages—coal and iron conveniently near each other, many other valuable minerals, and a good location for trade by land and sea. Second was the hard-working, obedient character of the German people. Third was the inspiration derived from the successful wars, under Prussian leadership, which brought the German Empire into being in 1871. This made all Germans willing to accept rigid Prussian discipline and autocratic government control of private industry and affairs, because of benefits produced. Germany then rapidly completed her splendid sys-

tem of railroads and canals, while capitalists, with government coöperation, rapidly built giant industries. In doing so, German industry made extensive use of science, particularly chemistry, and German education was largely shaped to meet state and industrial, not individual, needs. Children destined by birth or family wealth to be officials, scientists, army officers, or business executives, after three years in primary school, attended a *Gymnasium* (classical course), *Oberrealschule* (scientific course), or *Realgymnasium* (mixed course) for nine years, then a university. Their parents paid their expenses; but their military training lasted only one year, not three. These *Einjährigen* ("one-yearers") received all the better positions. Poorer children received primary training, then attended trade or vocational schools, and perhaps a technical college. To compensate workers for limited chances to rise, the state provided for sickness, old-age, and unemployment insurance. To win foreign trade Germany, instead of trying to sell surplus goods made for home consumption, as other nations then did, sent agents throughout the world to find what people wanted, then made goods to suit. All these policies account for Germany's rapid rise in industry and foreign trade, and in large part for her international attitude before the first World War.

TWO THOUSAND YEARS of German History

AS FAR back as we have any record, Germans have inhabited the greater part of this land, but their remote ancestors probably came from the grasslands of southern Russia. Romans and wandering German tribes fought one another as early as 113 B.C. While Julius Caesar was governor of Roman Gaul, which extended to the Rhine, he drove back two German tribes which had settled west of that river (55 B.C.).

The Roman historian Tacitus (98 A.D.) described the Germans as a rough, barbarian people; tall, fair-skinned, and blue-eyed. They lived in rude villages in their gloomy forests, wore garments of skins, and the men spent their time warring and hunting.

Two hundred years later the Germans—now formed into great groups or nations called Goths, Franks, Frisians, Saxons, Vandals, and the like—began to press into the weakened Roman Empire. When the period of the migrations was ended, the Roman Empire had fallen in the West. Most of the barbarian conquests were absorbed into the kingdom of the Franks, which reached its height under Charlemagne (see Charlemagne). The break-up of the Frankish Empire in the Partition of Verdun (843 A.D.) marks the real beginning of both France and Germany as separate states.

Story of Troubled Lorraine

Between the two countries lay a middle strip called Lorraine, which at this time extended westward from the Rhine to the Scheldt River and from the Vosges Mountains to the North Sea. For a thousand years this region was the object of conquest and the seat of European wars, and in 1914 Germany possessed about one-third of it. On the east Charlemagne's effective empire had extended only to the Elbe River and its tributary the Saale, beyond which line dwelt Slavic tribes. The eastward extension of German rule to the Vistula and Memel rivers, with accompanying German colonization at the expense of the Slavs and remnants of other peoples, was the work of another ten centuries.

The conversion of the Germans to Christianity was the work of Irish monks and then of the Englishman, St. Boniface, the "Apostle to the Germans" (see Boniface, Saint). The Saxons of north Germany, however, remained heathen until the time of Charlemagne, when they were converted by the sword.

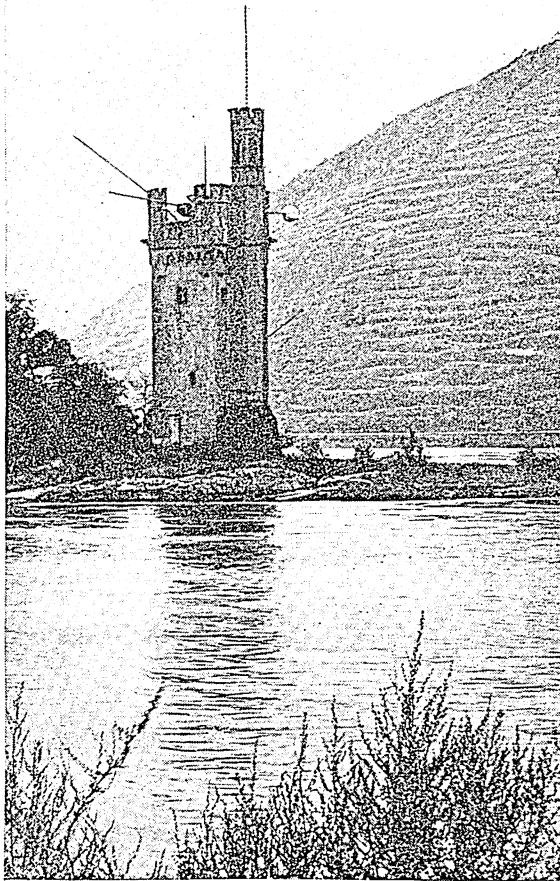
For several hundred years after 843 Germany was divided into a number of great "stem duchies," each the home of a separate stem or branch of the German

people. The chief of these duchies were Bavaria, Swabia, Franconia (on the middle Rhine and its tributary the Main), and Saxony (from the Ems River to the Elbe, north of Franconia). The Franconian duke was the first to become German king after the ending of Charlemagne's line (911). Then for five generations the Saxon dukes wore the crown. The greatest of this line was Otto I, the Great (936-973), who revived Charlemagne's empire. It included Germany and Italy, but not France. This revival of the empire drained Germany's energies for centuries, as successive emperors sought to enforce their claims, particularly over Italian cities and states, and in quarrels over respective rights with various popes (see Holy Roman Empire).

Following the Saxon kings the Franconian (or Salian) house again ruled. In its time the empire was convulsed by a great "Investiture Conflict" between church and state, led by the Emperor Henry IV (1056-1106) and Pope

Gregory VII (Hildebrand), and their successors. After the Salian emperors came the Hohenstaufens, so called from their castle in Swabia. Frederick I, called Barbarossa or "Red Beard" (1152-90), and his grandson, Frederick II (1215-50), were the most important of the Hohenstaufen emperors, and each of those rulers also was engaged in long conflicts with the papacy. Feudalism and the attempt to rule Italy along with Germany broke up the stem duchies into a thousand or more fragments. Everywhere arose

"MOUSE TOWER" ON THE RHINE



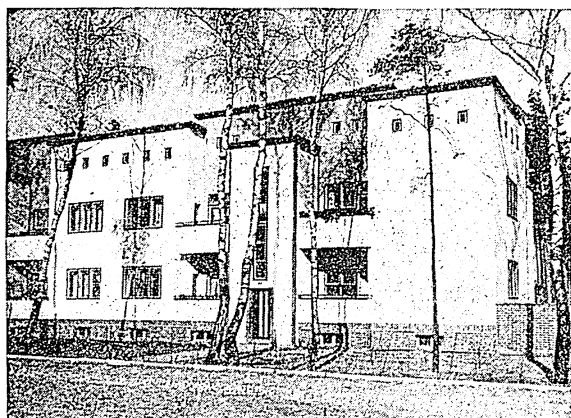
Ancient legend tells of the wicked Bishop Hatto of Mainz who fled to this historic tower near Bingen in the 10th century and there was killed by an army of rats. Actually the tower was built 200 years later.

robber barons, who ruled from their hill-top castles by *Faustrecht* ("fist law"). But the strength that ebbed from the German kingship grew in the hereditary princely states. The Golden Bull (1356) of Charles IV definitely fixed the right to elect the emperor in the "Seven Electors"—the archbishops of Mainz, Cologne, and Treves, the Margrave of Brandenburg, the Elector of Saxony, the Count Palatine of the Rhine, and the King of Bohemia. By confirming the powers of these and other princely states, and of the numerous "free cities," Charles IV "legalized anarchy and called it a constitution."

Even Charles V (1519-56), who in addition to Germany ruled the Netherlands, Spain, Austria, Naples, and Sicily, and large parts of the New World, was unable to put down the Reformation started by Luther, and one of the chief reasons was the support given it by the rulers of important German states. The terrible Peasants' War of 1525 failed completely. The religious struggle called the Thirty Years' War (1618-48) weakened the central power still further. Thenceforth the head of each of the several hundred German states was practically an absolute ruler, and the Hapsburg emperor was a mere figurehead, without power save in Austria and his other hereditary lands. Disunited Germany was depopulated, commerce almost destroyed, and the people burdened with heavy taxes to support the incessant wars.

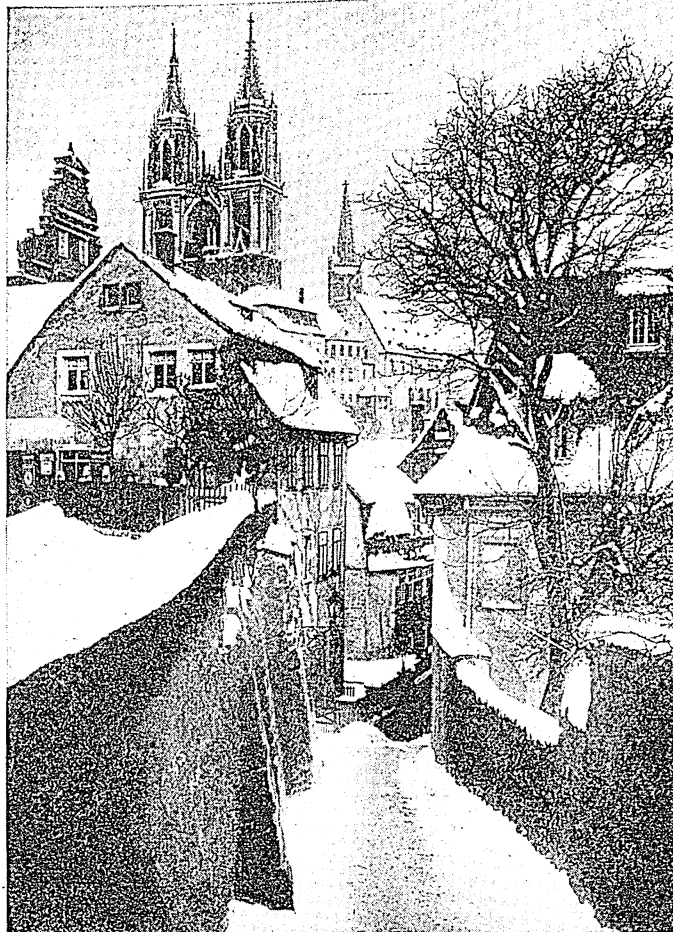
But the latter part of the 18th century brought promise of better things. Frederick the Great increased his kingdom of Prussia at the expense of Austria and Poland by most unscrupulous war and statecraft, but he made his possessions a strong well-ordered state. He thus prepared the way for a closer union of Germany,

MODERN ARCHITECTURE IN GERMANY



Unadorned simplicity, with firm rectangular lines, was the ideal of architects in Republican Germany. Above we see a group of apartment houses in Zehlendorf, a Berlin suburb.

IN THOUSAND-YEAR-OLD MEISSEN



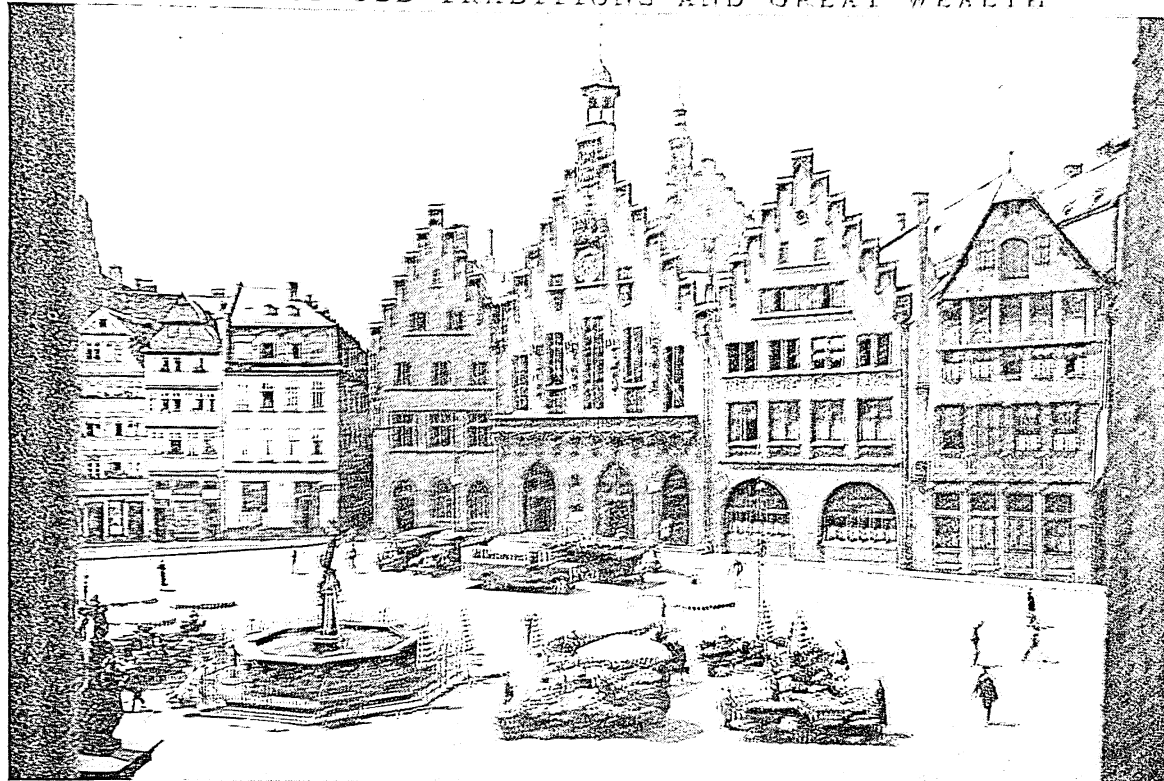
The charm of medieval Germany still rests upon Meissen, with its fine old Gothic cathedral towering over the older part of the town. Meissen has been the center of the so-called "Dresden" china manufacture since 1709.

under a new and stronger headship than that of Austria. At the same time intellectual Germany flowered forth in a national literature in which the names of Herder, Goethe, Schiller, and Arndt represent the choicest blossoms. An idealistic philosophy, immortalized by the works of Immanuel Kant, Fichte, Schelling, and Hegel, was mother of the fruits of this period.

The Napoleonic Wars also helped, though again Germany was left trampled and bloody in the wake of battle. The crushing defeat of the Prussians at Jena (Oct. 14, 1806) compelled a reorganization of that kingdom, in which serfs were set free and the beginning made of Prussian universal military service.

After the fall of Napoleon the Congress of Vienna (1814-15) grouped the German states—now reduced from several hundred to 39, including Austria—into a loose German Confederation. Its only head was a diet or assembly, composed of delegates appointed by the sovereigns, which met at Frankfort-on-the-Main. This feeble body was merely a veil for the rivalry of Austria and Prussia for leadership. When the demo-

A CITY OF OLD TRADITIONS AND GREAT WEALTH



Frankfort-on-the-Main is one of the most interesting as well as the wealthiest of German cities. Home of the original Rothschilds, it is one of the banking centers of the world. Frankfurt was settled in Roman times and carries many buildings and legends of historical interest. The scene above is the Roemer Square market place.

cratic wars of 1848 swept over Europe the liberals of Germany arose and demanded democratic government and a united state, but the movement failed.

New Empire Created by Bismarck

The actual creation of the new German Empire was the work of Bismarck (*see* Bismarck, Otto von). For years he was Prussian delegate to the Frankfurt diet, and so was in the thick of Austrian and Prussian rivalry for the German leadership. He believed that only on the field of battle—by “blood and iron”—could that issue be settled. By skillful maneuvering Bismarck brought about war with Austria in 1866. Prussia’s rival was decisively defeated at Sadowa (Königgrätz) and forced to submit to a reorganization of Germany which excluded Austria. The states of Hanover, Hesse-Cassel, Nassau, and the free city of Frankfurt, which had supported Austria, were ruthlessly annexed by Prussia. The other German states north of the river Main then united with Prussia in a North German Confederation (1866–70). South Germany was left out, for Bismarck knew it must ultimately join unless France blocked his plans.

Four years later Bismarck tricked France into declaring war, in which she was crushing defeated and Paris taken. France was forced to pay a billion dollars indemnity, and cede Alsace-Lorraine to Germany. The enthusiasm aroused by this war brought the south German states into the new Prussian

organization. It was completed by the proclamation in the French royal palace at Versailles (Jan. 18, 1871), of the new German Empire, with the king of Prussia as perpetual German Emperor (Kaiser).

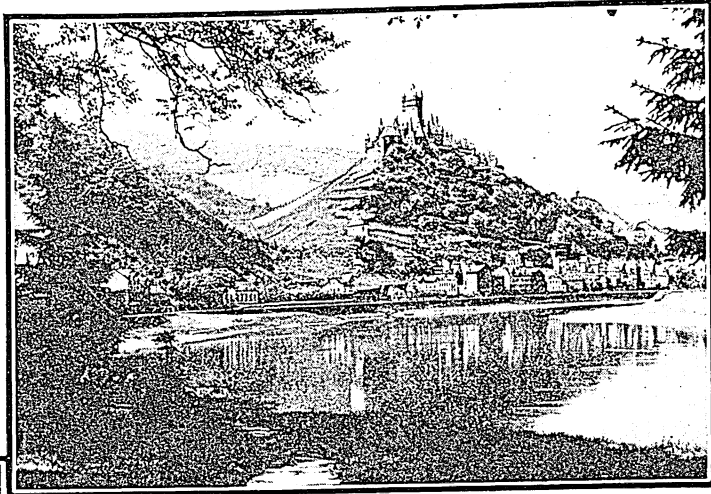
There was a popularly elected Reichstag, or legislative chamber, but the real power lay with the Prussian warlord as emperor. The chancellor, who headed the administration, was responsible only to the emperor.

Under the skilled leadership of Bismarck as chancellor in the reigns of Emperor William I (1871–88) and Frederick III (March–June 1888), the new empire grew rapidly in vigor, industrial prosperity, and power. Troubles arising with the Council of Rome were settled. Far-sighted laws were passed giving pensions under government control to laborers disabled by accident, sickness, or old age. The beginning was made of a colonial empire which ultimately included about 1,000,000 square miles in Africa (Togo-land, Cameroons, German Southwest Africa, German East Africa) and 100,000 square miles in China and the Pacific Islands (Choochow Bay in Shantung province, Kaiser Wilhelm Land in New Guinea, Bismarck Archipelago, Caroline Islands, etc.).

Two years after the accession of Emperor William II (1888–1918), Bismarck was abruptly dismissed by the impetuous young Kaiser. The latter’s aggressive foreign policy, hostility to the League conferences, increases of the army, naval rivalry with England,

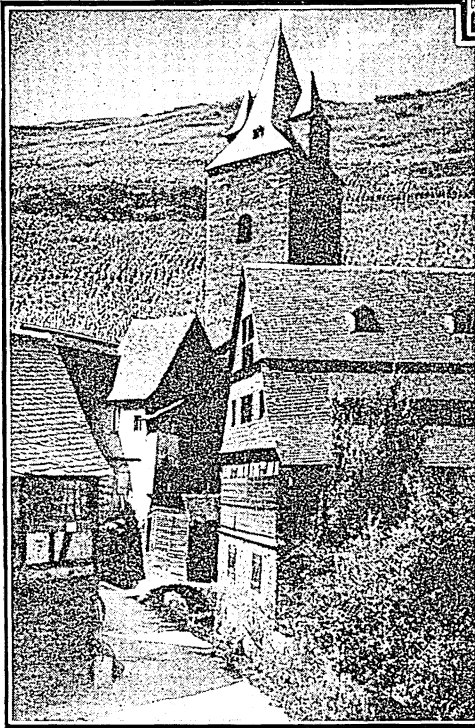
flirting with "Pan-Germanism," and support of Austria in the Balkans, and his incessant "rattling of the sword" led France, Russia, and Great Britain to create the Triple Entente as a protection against the aggressive German Empire. Germany's decision to back Austria against Russia in 1914 precipitated the World War. (See World War of 1914-1918.)

The terrible privations of the war, coupled with the undermining propaganda of Communists, weakened the nation's loyalty to the Kaiser. On Nov. 9, 1918, the German Republic was pro-



THE CHARM OF THE OLD GERMANY—

Quaint Old World customs and places lured the tourist of former years into the heart of Germany. Above, you see Cochem Castle on the Moselle River. Once the home of archbishops, it was destroyed by the French in 1689 but later rebuilt. All the beauties of the Rhineland are found in the picturesque village of Bacharach. "Painter's Corner" is seen at the left.



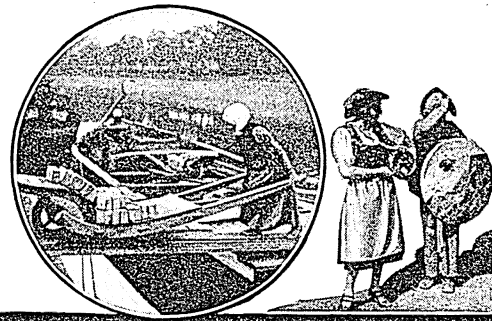
claimed in Berlin, and that night William II fled for safety into Holland. After the collapse of the empire, the Communists at once attempted to establish in Germany a soviet government like that in Russia, but failed. In January 1919 popular elections returned a moderate national assembly which drafted a constitution providing for a democratic republican government with universal suffrage, both male and female. The president was to be elected by popular vote for a seven-year term. Friedrich Ebert, a Socialist, became first president. Field-Marshal Paul von Hindenburg, idol of the German people, was elected president when Ebert died in 1925.

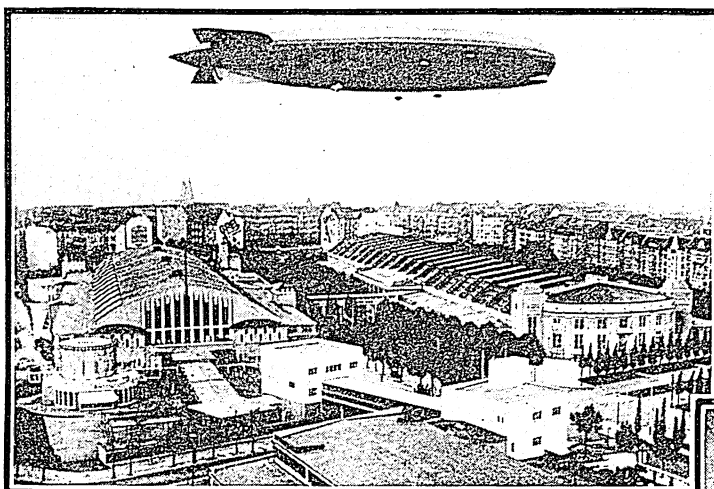
Many class distinctions and privileges were abolished, particularly in the schools. Under the new system, all children attended a *Grundschule* (primary grades) three or four years. Those intending to work early continued in the *Grundschule*; others transferred either to a *Mittelschule* (middle school), which prepared them to start work about 16, or entered liberalized secondary schools for nine years of preparation for a university. This system was later radically altered by the Nazi régime.

The man who figured most conspicuously in the field of international affairs in the decade following the first World War was Gustav Stresemann. This distinguished statesman became foreign minister in the critical days of 1923, and held



Here are students of the ancient university of Würzburg—founded in 1402 and famous for its medical training. Heavy work was a woman's lot in old Germany as you can see from the picture at the right. Characteristic of this era also were the gay costumes worn on all fête days.





AND GERMANY AS IT IS TODAY

In striking contrast with the quaint charm of the old Germany we see, above, a modern note as a giant dirigible soars over Berlin. Throughout the land this modern spirit in design and architecture is finding expression in new buildings such as the Palace of Arts, right, in Düsseldorf, remembered as the boyhood home of Heine, who was once Germany's beloved poet.

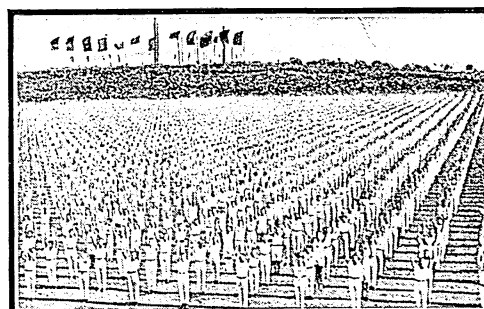
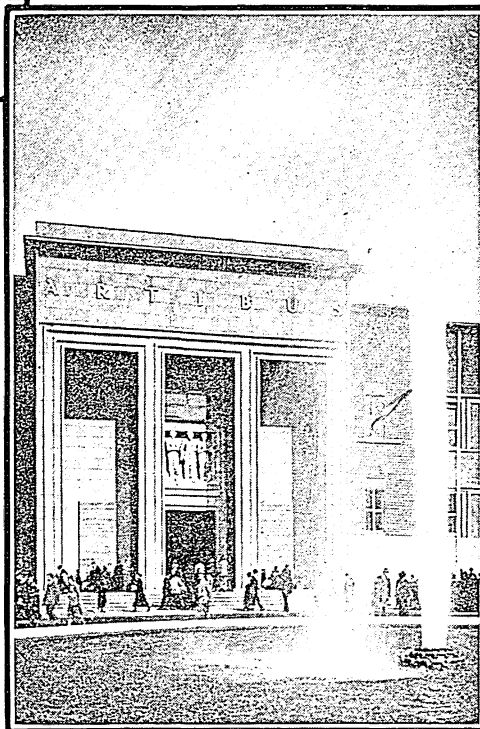
that office until his death in 1929. His policy of reconciliation and coöperation with the Allies led to the signing of the Locarno treaties in 1925, and to Germany's admission to the League of Nations in 1926, with a permanent seat on the Council, and to the reduction of reparation payments (*see* World War). His efforts, too, were chiefly responsible for ending the vexatious occupation of the Rhineland by Allied armies. In June 1930 the last French troops were withdrawn.

Background of the Nazi Revolution

But even with the reparation payments lightened, German finances were not sound. Many wealthy Germans, losing confidence in German currency, sent their money abroad. The government was driven to printing great quantities of paper money without any gold backing. The mark became worthless, the money system collapsed, and the wealth of those with savings was completely wiped out. A new money unit, the reichsmark, backed by gold, was established in 1924, and conditions improved temporarily. But the world depression beginning in 1929 hit Germany early, and many of those who had lost heavily in 1924 again encountered hard times. As the wealth of the country decreased, it became harder for the government to collect taxes. The parties in the Reichstag (parliament) could come to no agreement; and the parties with radical solutions, especially the Communists and the Na-

tional Socialists (Nazis), grew rapidly.

The Nazi movement had existed since 1920. In 1923 Adolf Hitler, Nazi leader, and General Ludendorff had made an unsuccessful attempt to seize power from the weakening republic (*see* Hitler, Adolf). But after 1930 the rise of the Nazis was rapid because the people believed that they possessed remedies for the country's troubles. The peace treaty had declared that Germany and its allies were alone responsible for the war, and this filled the Germans with shame and indignation. The treaty had also con-



German athletes in a Turnfest at Cologne and a girls' dancing class in Hanover.



demned Germany to suffer permanent loss of wealth and power. Germans born between 1900 and 1915 had grown up amid the hardships, disorders, and intense emotional crises of the war and postwar years, and when they were old enough to work, conditions had become so bad that no work could be found. Under these conditions the youth of the country saw little hope for the future without radical changes. The small shopkeepers and those living on inherited money or on savings had seen their wealth swept away by inflation, and now the possibility of regaining it was blocked by the depression. Unemployment caused so much labor unrest that industrialists and landowners became frightened and looked for a strong government to protect them.

The Nazi Program

As a solution for these problems the Nazis prepared a 25-point program. It was based on the belief that the Germans were a superior race and needed only to build up and unify their strength. The Nazis proposed first to put an end to the restrictions of the German and the Austrian peace treaties. All Germans, they planned, should then be united in one German nation; all non-German elements, including Jews, should be eliminated; further immigration should be barred. There must be food and work for all Germans, but no income without work, except that the aged must be cared for. Germany must have colonies to take care of its surplus population and to provide such food as could not be produced at home, but at the same time a strong farming class must be built up to increase the home food supply. To reestablish prosperity for the middle class, the large department stores must be broken up and the big trusts must be controlled by the government. There must be no war profiteering, and peacetime profits must be widely distributed and not retained in a few hands. The health of the nation must be improved by protecting mothers and children, by developing sports, and by returning part of the city population to the country.

To accomplish these aims the government must be strong. Political parties must be abolished and a "totalitarian" state set up. Obedience to the decisions made by the leaders must be the prime virtue for the people (*see Fascism*). Children must be educated in the aims of the new government. Religion must teach nothing contrary to government aims. The German press must have German editors and workers exclusively, and art and literature must conform to German standards. The army must be drawn from the whole people, and must no longer be a small body of professional soldiers.

The Nazis Gain Control of the Government

Political disorder played into the hands of the Nazis. The Reichstag could govern successfully only if a group of parties strong enough to form a majority could work together. During the depression the moderate program of the liberal parties controlling the government failed to improve conditions. Many joined the Nazi and Communist parties, and the

moderate parties thus lost their majority in the Reichstag. The Nazis and Communists, however, fought both in the Reichstag and in the streets, and of course refused to work together to form a government. Yet neither could win a majority of seats in the Reichstag. When government by majority proved impossible, government by emergency decrees of the President and the Chancellor was tried.

When this also failed, President Hindenburg was finally forced, in January 1933, to ask Hitler as leader of the Nazis to become chancellor. Hitler formed an alliance with the Nationalists, the most conservative party, controlled largely by big landholders, and called for a new election. After seizing the Communist headquarters throughout the country and blocking all use of the radio except by his own supporters, he secured a majority for the allied ticket.

The Rise of Hitler

Hitler then undertook the double task of destroying the republican form of government then existing, and of popularizing the Third Reich, as the new government is often called. The Reichstag voted to give the cabinet, of which Hitler was the head, the power to govern by decree for four years, and then adjourned. Hitler broke up all other political parties—including his allies, the Nationalists—by inducing them to disband or by seizing their property and closing their party offices. He then transferred to the central government the powers of the German states by appointing regents to govern in the place of the state legislatures and ministries. When Hindenburg died, in August 1934, Hitler took over the powers of president as well as of chancellor, becoming undisputed dictator (*see Dictatorship*).

To unify German thinking, it was necessary both to direct its course and to suppress objecting voices. Guarantees of free speech and free press, stipulated in the 1919 constitution, were removed, and objectors were imprisoned in concentration camps. The government took control of all newspapers, and of all expressions of art, including painting, literature, and the theater. A Ministry of Propaganda and Popular Enlightenment was set up to control and direct all these activities. People's courts were established to try those accused of acting and speaking in opposition to the interests of the state.

The Nazis did not confine their task to the suppression of opposition, but set up a highly efficient system of propaganda to popularize their own program. The press and the radio were used to give the people daily information and instruction concerning government plans. When Hitler, an unsurpassed emotional orator, spoke, all other activity in Germany was stopped, so that everyone might listen. Enormous parades and demonstrations for labor were held every May Day. The annual Nazi party congresses at Nuremberg demonstrated the full force of the new Germany in outdoor assemblies, where hundreds of thousands gathered to pay tribute to the nation and its leader. The almost universal support which Hitler was able

to command was demonstrated by plebiscites, in which more than 90 per cent of the voters gave him their support. Using propaganda to the utmost, the government now proceeded to carry out the constructive part of the program.

Building a New Germany

The first step was to eliminate Jews from public life and business. A campaign of terror and confiscation drove many Jews to foreign lands, but many more remained, living in poverty and despair. The Catholic and Protestant churches were also attacked in an effort to make them conform to Nazi ideals.

A vital part of the Nazi plan was its intense propaganda campaign to gain the support of the younger generation. Organized training of youth now begins at the age of ten. Bodily fitness, love of the German race and German soil, and the equality of all Germans are stressed. At 14, the boys enter the "Hitler Youth," and the girls, the League of German Girls. On leaving the youth groups, both boys and girls are sent away from home for six months of labor, regardless of family or wealth. After this service, boys go into the army for two years. During this period from youth to maturity, intensive training is given in Nazi principles, and boys and girls with proper qualifications are selected to become leaders.

The party organization closely parallels that of the government. It functions through a cabinet, with Hitler as the head. Its members supervise every aspect of the country's life. Germany is divided into districts, with a Nazi leader in each, and into "cells," or small groups of party members, in every factory, office, and rural district in the country, who are responsible for coöperation with government aims. Two military groups, the Storm Troops and the Special Guards, serve as combined police and party army; the regular police are under the control of party members. Each local and organization leader is subject to some higher authority, all centering in "the Fuehrer," Hitler, whose word is law.

Various classes of the population are aided by the government. Farmers are guaranteed the possession of their farms, and are not ordinarily permitted to leave them to live in the city. The government fixes the price of their products, so that they cannot profit or need they sell at a loss. The workingman in the city is either provided with work or given state aid to keep him from want. He cannot be locked out by his employer, but he cannot join a union or strike. Disputes about wages or working conditions must be settled directly with the employer or through labor courts under party supervision. Vacations and recreation are provided at government expense.

Efforts to Make Germany Self-Sufficient

To free Germany from the restrictions of the Versailles Treaty, the party program called for a strong Germany free from dependence on other nations. Besides helping the farmer to produce more, the government restricted the use of various foodstuffs and taught the use of substitutes for scarce foods.

To sell goods abroad they must be cheap; so Germany's home manufacturers were forced to pay a tax with which exporters were subsidized to enable them to sell their goods at low prices. Various restrictions, such as quotas and barter agreements, were placed upon imports (*see* International Trade). Germany bought not where it could buy most economically, but where it could sell German goods in exchange. Raw materials were given preference among imports, especially materials for the armament industry. Preference was also given to the imports of nations with which Germany had clearance agreements, that is, agreements permitting Germans to pay for foreign goods in marks. As a result of this policy, large sums piled up in German banks to the credit of foreign exporters. Since these sums could be used only to buy German goods, some countries cut down their exports to Germany; others, more dependent on the German market, increased their purchases of German exports.

These measures were organized into two "four-year plans." The first plan, extending from 1933 to 1936, was designed to promote economic recovery and to increase the supply of foodstuffs. The second, begun in 1936, was a plan for "economic rearmament," designed to enable Germany to withstand a blockade.

Internal Unrest Met by "Blood Purge"

Hitler's domination of the country had not been achieved without internal opposition. On June 30, 1934, he crushed this opposition in a single day of terror, the notorious "blood purge," by killing scores of the leaders who might have menaced his power. The Protestant and Catholic churches continued to resist government control. The lowered standard of living imposed by rearmament also caused some grumbling. Though thousands of citizens, including many famous scientists, artists, and men of letters, had fled the country, general satisfaction with Hitler's rule seemed to outweigh discontent.

Rebirth as a World Power

Hitler's popularity rested on his promise to restore to Germany the prestige and the military power lost in the World War. He was prompt in fulfilling that promise. His first step was to demand the right to rearm, which the Treaty of Versailles had forbidden. When this was refused at the Disarmament Conference of 1933, Germany left the conference, resigned from the League of Nations, and started rebuilding its armed forces regardless of treaty restrictions.

In January 1935 the people of the Saar Basin, who had been governed for 15 years by the League, voted to rejoin Germany. Hitler immediately announced his intention to restore all other "lost territory" to the Reich. In March 1936 he sent troops into the Rhineland. Then, in October, he formed an alliance with Italy, the "Rome-Berlin axis," and later brought Japan, Hungary, and Spain into an anti-Comintern pact to prevent the spread of communism.

Hitler Takes Austria, Czechoslovakia, and Poland

Rearmed and possessing new allies, Hitler was able to force England and France into a policy of "appease-

ment." His seizure of Austria in March 1938 met no opposition (*see* Austria). In September, by threat of war, he persuaded France and England to sign the Munich Pact giving the Sudeten regions of Czechoslovakia to Germany (*see* Czechoslovakia). Then in March 1939 he seized nearly all Czechoslovakia, and took from Lithuania the former German district of Memel. Defying a British and French guarantee of Poland's security, he made demands for Danzig and other territory. When Poland refused, Hitler signed a nonaggression pact with Russia in August 1939. Thus freed of a Russian threat in the east, on September 1 he annexed Danzig and invaded Poland. On September 3 England and France declared war.

Great Military Triumphs

At the outset of the conflict, Hitler announced that when he died, Marshal Hermann Goering, minister of aviation, would succeed him, and that the next in succession would be Rudolph Hess, National Socialist leader. One of the most sensational events of the war was an allegedly unauthorized airplane flight by Hess to Scotland in May 1941, reportedly for the purpose of arranging peace with England.

In September 1939 Germany conquered Poland by *Blitzkrieg*, or "lightning war," and partitioned it with Russia. In April 1940 it seized Denmark and invaded Norway. By the middle of June it had overrun Norway, Luxemburg, the Low Countries, and France. When France fell, Italy joined Germany in the war.

Germany then turned its mighty air force against England, furiously bombing London and other British

cities. The British bombed Germany and German-occupied territory. As it attempted thus to break British morale, Germany completed its domination of the continent, and launched a campaign against British power in the entire eastern Mediterranean region.

It occupied Rumania in October 1940 and Bulgaria in March 1941, with the "consent" of these nations. Then in April it joined Italy in an attack on Greece as well as Yugoslavia. Despite the resistance of a British expeditionary force in Greece, the German army quickly overran these countries. Hitler began integrating his conquests into a "new order" alliance, in which Japan would be dominant in "greater east Asia," and Germany and Italy in Europe. (*See also* articles on the countries named.)

Struggle Against Britain and Russia

Despite its involvement in a war with the British Empire, Germany on June 22, 1941, astounded the world by invading Soviet Russia. German armies, marching on Russia from the Baltic to the Black Sea, were joined by the forces of Finland, Rumania, and Hungary, which declared war. As reason for his violation of the nonaggression pact with Russia, Hitler charged that the Soviet Union had plotted with Britain and the United States against Germany. He also resumed his traditional rôle as a foe of communism. But the real significance of his new venture was that conquest of Russia, with its vast resources, would enable Germany to make a formidable bid for world domination. (*See also* World War, Second; and Germany in FACT-INDEX at the end of this volume.)

—REFERENCE-OUTLINE for Organized Study of GERMANY—

BEFORE the World War of 1914-1918 Germany was prosperous and powerful. A leader in science, education, and industry, it seemed well on the way to world supremacy. After the war it went through years of suffering. Its thrifty and industrious people were slowly improving their condition when world depression brought a new crisis. Hitler and his Nazi party then came to power and rebuilt the nation's military strength in defiance of the Treaty of Versailles. They took Austria and dismembered Czechoslovakia with little opposition from France and Great Britain, but, when they invaded Poland in 1939, they were plunged into another life-and-death struggle.

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MAN'S DEADLIEST FOE—*The Microbe*

GERM THEORY OF DISEASE. Most diseases, we now know, are due to the presence in the body of exceedingly tiny vegetable or animal organisms, which produce poisons that attack the system. These poisons interfere with the functions of the body, cripple or destroy its various organs, bring about decay and often death. This is believed to apply to nearly all diseases in men, beasts, and even trees and plants, although the germs of some diseases have not yet been discovered.

We must remember that the world about us—soil, air, and water, plants and animals—is filled with

If you told a savage who was ill with typhoid fever that the cause of his suffering was a creature so small that 10,000 of them put end to end would be less than an inch long, he would probably reply bitterly that you were taking advantage of his weakness to spin fairy tales. "Don't I know," he would say, "that an evil spirit has brought this upon me?" No magician or witch doctor ever conceived of a creature half so startling as a microbe, a form of life so small it cannot be seen by the unaided eye, yet it claims more victims than all wars, fires, floods, earthquakes, and other deadly agencies put together.

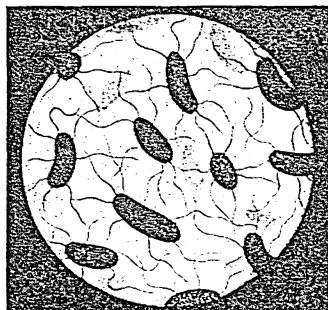
millions of invisible living beings called *micro-organisms*, from the Greek *mikros*, meaning "small." These may be of the vegetable type, called *bacteria*, or the animal type, called *protozoa*. There are still smaller bodies, called *viruses*, which act in many ways like the microscopic

plants and animals. All three are often considered together as "germs."

Not all germs are harmful to man. Many of them, especially the vegetable bacteria, help to make life possible (see *Bacteria*). But others cause trouble or disease whenever they can enter the body. These are called disease germs. Most of them belong to the

bacteria. These are divided into *bacilli* (rod-shaped), *cocci* (round), and *spirilla* (corkscrew shaped). The term "microbe" is a popular name for all bacteria.

TYPHOID BACILLI



These germs cause typhoid fever. Notice the "flagella" or tails.

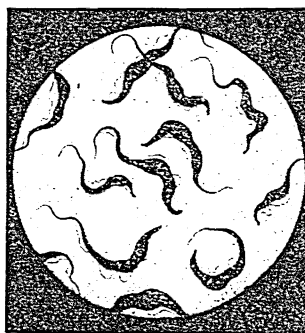
A particular form of bacillus was always found in the blood of cattle and sheep afflicted with anthrax, a violent disorder that killed thousands of the animals every year and even attacked human beings. But this observation was merely a beginning. To prove that these bacilli were the real cause of anthrax, they had first to be isolated, that is, separated from all other substances found in the blood of the diseased sheep or cattle. This was done, in 1863, by Robert Koch, a noted German bacteriologist. The anthrax bacilli then had to be grown in what is called a "pure culture"—that is, allowed to multiply under artificial surroundings without losing their poisonous strength. It was not until 1876 that Koch accomplished this and arranged the final test.

A few perfectly healthy sheep were chosen for the experiment. In the presence of several eminent scientists, a quantity of the liquid containing the anthrax bacilli was injected into the blood of each of the sheep. Within a few days all had contracted anthrax and died. This is believed to have been the first conclusive proof that any specific disease is caused by a specific germ.

The anthrax experiment started a long chain of successful discoveries and tests which are continuing to this day. Scientists have isolated, one by one, the bacteria of blood-poisoning, erysipelas, cholera, typhoid fever, bubonic plague, pneumonia, meningitis, diphtheria, tetanus (lockjaw), tuberculosis, leprosy, whooping cough, and many other diseases. Among the ailments which have been definitely traced to animal organisms (protozoa) are malaria, amoebic dysentery, kala azar, and African sleeping sickness. Some diseases, such as chicken pox, smallpox, yellow fever, infantile paralysis, and perhaps measles, influenza, and common colds, are caused by viruses (see Plant Life, subsection "Diseases of Plants").

The development of powerful compound microscopes in the 17th and 18th centuries had shown the existence of many micro-organisms, but it was not until the middle of the 19th century that their activity in producing disease was established. At that time, scientists observed that

TRYPANOSOMES



These protozoa are injected into man's blood by the bite of the tsetse fly and cause the deadly sleeping sickness.

Certain diseases like beri-beri and pellagra appear to be due to a faulty diet which lacks an essential vitamin; other disorders are traced to the failure of specific organs to function properly, but even in such cases the question of indirect germ influence is sometimes raised. That all infectious diseases are due to some sort of germ or microbe is now almost an axiom. There is no doubt that the germ theory of disease has been the most fruitful generalization in the history of medicine.

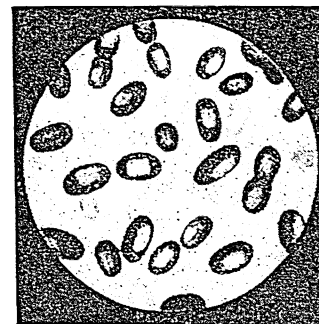
Disease germs do their deadly work by forming poisons or "toxins" in the system. The symptoms of a disease depend upon the nature of these poisons and the positions in the body occupied by the germs which generate them. Some germs remain in the blood stream, which carries their poisons to all parts of the system. Others seek out special organs like the lungs, the stomach, the liver, the intestines, and the effects of their poisons are felt most powerfully in these localities. Certain toxins, like those of hydrophobia, attack principally the nerves, spinal cord, or brain.

Probably the greatest benefit resulting from the discovery of the germ theory was the fact that it solved most of the mystery of how diseases spread. By studying the habits of germs, scientists discovered how they grow, how they travel from place to place, and how they enter the human body. They learned that few disease germs can live long outside the body. A few may live for a time in water, or may multiply to some extent in milk and food. The meat of diseased animals may carry bacteria. But for the most part bacterial diseases are transmitted by contact with persons suffering from the disease or with carriers. "Carriers" are persons who are not themselves ill, but who harbor (usually in the throat) germs capable of causing disease in others.

Germs on the skin may be introduced into the blood and tissues by a cut or scratch, and thus cause disease. Abscesses, erysipelas, tetanus, and blood-poisoning are caused in this way.

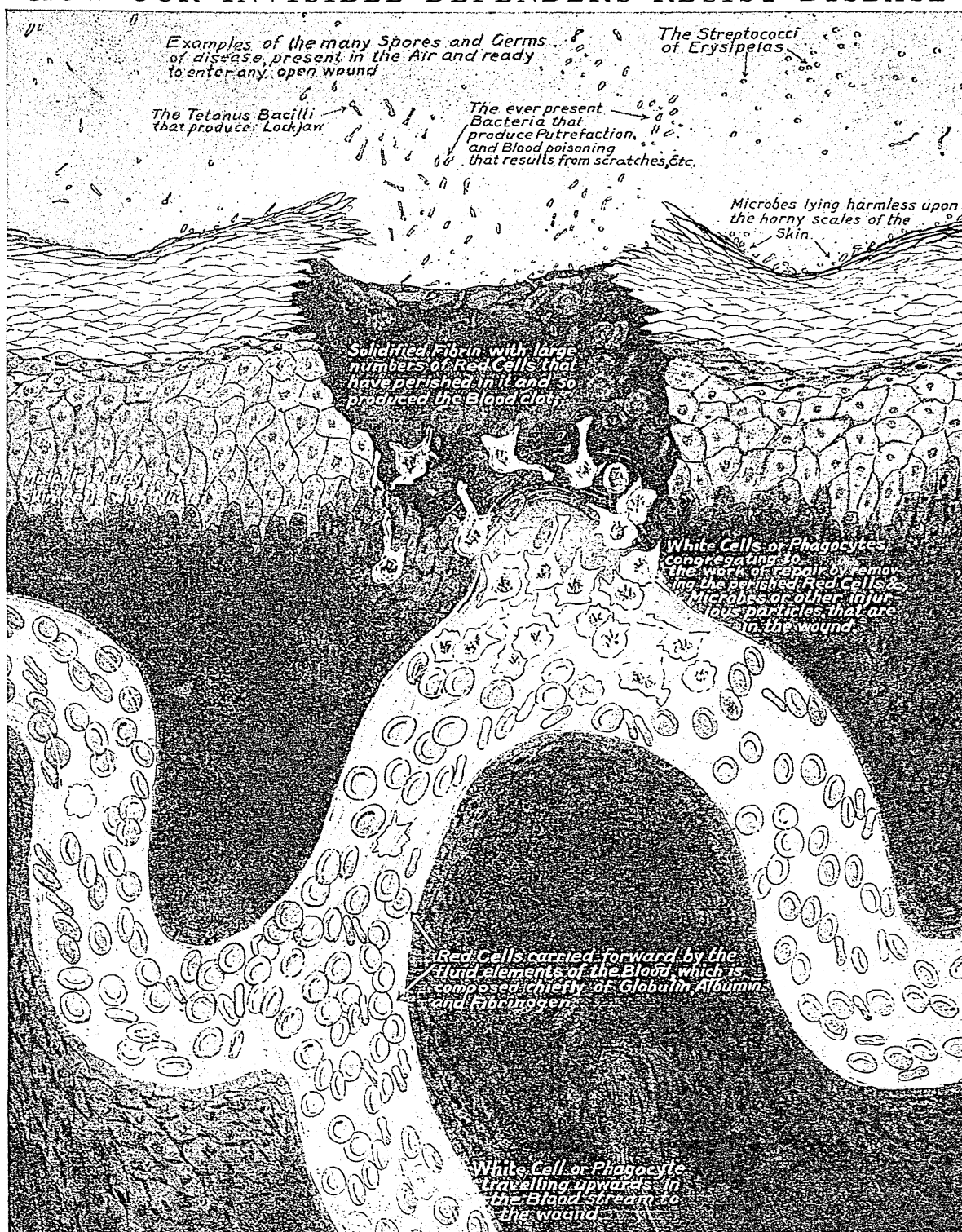
Perhaps the most amazing of all these discoveries was that many deadly germs enter the body through the bites of insects. Malaria and yellow fever, for instance, are transmitted by certain types of mosquitoes (see Mosquito). Sleeping sickness is carried from person to person by the tsetse fly (see Tsetse

PLAGUE BACILLI



They look mild, but have killed millions with bubonic plague.

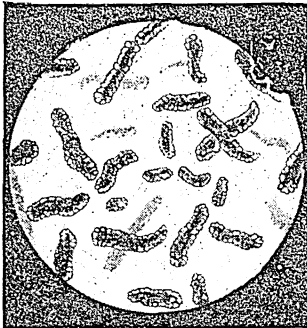
HOW OUR INVISIBLE DEFENDERS RESIST DISEASE



Here the artist has pictured on a greatly enlarged scale what goes on in a portion of skin no larger than the head of a pin, when disease germs try to enter through a cut or broken place. Beneath the skin is a tiny capillary, with blood passing through on its normal errands. When the skin breaks, the blood of course rushes into the opening. Contact with the air dries it into a clot which fills the wound. But imbedded in this clot are disease germs which had been quick to take advantage of the opening. The blood at once takes up the fight. Certain fluids—"bactericides"—try to kill them directly, by chemical action. Other fluids—"opsonins"—try to make them digestible for the white blood cells or phagocytes. These cells swarm to the point and eat the "predigested" germs. You can see several of them with their "meals" already inside. If the body is in good condition and the germs not too malignant, the blood will win; if not, the germs make good their entrance and disease begins.

Fly). The bubonic plague is transferred to human beings by fleas which have bitten diseased rats (see Black Death; Flea; Rat). Typhus fever, which scourged some of the war-ridden countries of Europe

DIPHTHERIA BACILLI



Thanks to antitoxin, these germs have lost much of their terror.

during the World War of 1914-1918, is carried by the "cootie," or body-louse. While the danger from germs of all kinds must be carefully considered by persons who wish to avoid disease, this danger must not be exaggerated. Not every disease germ which enters the human body actually causes trouble; otherwise we would be ill most of the time, for we take in germs with nearly every breath and every mouthful of food and drink. In the blood and tissues of all healthy persons there is a tendency to resist and destroy unwelcome visitors. Many individuals, in fact, seem to be naturally immune to certain maladies; the germs can get no foothold in them. It is when the body is allowed to weaken through bad habits, overwork, improper food, insufficient exercise, etc., that microbes find themselves able to launch their deadly work.

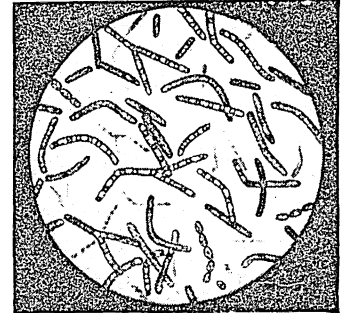
Few germs are able to penetrate the human skin. The favorite breeding places of the *streptococci* or pus germs are the teeth and the mucous membranes of the nose, mouth, and throat. And these streptococci not only produce a great many disorders themselves, but they are a sort of advance agent, paving the way for other disease germs. Breathed in from the air, they find lodging perhaps in the folds of the tonsils, and if the tonsils have been weakened by mouth-breathing, by dust-laden air, by exposure to extreme heat or cold, the germs may thrive and start forming pus, which soon gets into the blood stream and infects the whole body. Or maybe the teeth, through improper care, become refuges for germs. Certain forms of heart disease and rheumatism are thought to be caused by bacteria entering the blood through the tissues about diseased teeth.

Many of the diseases caused by viruses are both dangerous and highly contagious. They can be fought, however, by the same sort of treatments as those used for other germ diseases when the virus has been discovered and studied. There seems to be one helpful virus called *bacteriophage* ("bacterium eater"), which attacks and destroys bacteria themselves. Scientists

are trying to find ways to use bacteriophage in combating bacterial diseases.

There are three ways of fighting the diseases caused by germs: (1) by the general destruction of the germs; (2) by preventing them from entering the human body; (3) by overcoming their evil effects, after they have made their way in. The first of these methods is usually carried on by public sanitation, which strives to do away with the breeding places of germs by disposing of sewage and garbage, by keeping water supplies free from contamination, and so on (see Health Department). The second method is illustrated by personal cleanliness, using disinfectants in wounds, the proper care of the mouth, nose and throat, boiling

THE "WHITE PLAGUE" GERM



These curious striped bacilli are the cause of the dreaded tuberculosis.

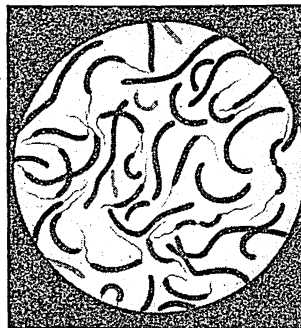
drinking water, fumigating sick-rooms, etc. (see Antiseptics). The last method includes the whole field of curative medicine and surgery, with particular emphasis on vaccine and serum treatments, and the use of specific drugs (see Antitoxins).

Despite all that has been done to solve the problems of medicine since the discovery of disease germs, there still remains an immense field for the scientist to explore. A comparatively few germ diseases can be cured or prevented by appropriate treatment, but the others are still uncon-

quered, and the world knows no greater heroes than the men who devote their lives in obscure laboratories to the battle against man's worst foe—the microbe.

GERRYMANDER (jĕr'ry-măn-dēr). In 1812 the Democratic-Republican party was in power in Massachusetts, but could not hope to retain its control in the approaching elections. To save something for the party, the legislature passed and Gov. Elbridge Gerry, later vice-president, signed a reapportionment bill constructing at least one representative district of exceptional unfairness. A Federalist editor, wrathful at the trick that was played upon his party, hung a map showing this district over his desk where all might see it. Gilbert Stuart, the famous painter, noticed the monstrosity one day, and with his ready pencil added head, wings, and claws, exclaiming, "That will do for a salamander." "Better say Gerry-mander," growled the editor, a bitter opponent of Governor Gerry. The uncouth name for this political trick passed into current use, and today is to be found in any dictionary of the English language.

CHOLERA GERMS



These bacteria are of the "corkscrew" or spirillum type.

The "gerrymandered" district may be a city ward, a legislative district, or a congressional district. The purpose is to pack hostile majorities into two or three populous districts, leaving the rest "safe" for the party in power and thus giving it a larger number of representatives than its votes really warrant. One famous southern congressional district in which the negro vote was concentrated was 300 miles long and 20 wide. Happily an aroused political conscience has diminished the number of such extreme cases of gerrymandering.

GETTYSBURG, BATTLE OF. "The most terrific combat on record"; "A great and glorious victory for the Potomac Army"—these were some of the headlines that appeared in Northern newspapers on July 4, 1863, after the close of the three days' struggle at Gettysburg, Pa. The South had expected a victory that would soon bring peace. For a time it seemed that they would not be disappointed, but in the end they failed, and from that time the tide of war set against the Confederacy.

In June 1863, General Lee had decided to carry the war into the North by an invasion of Maryland and Pennsylvania. This, he thought, would strengthen the peace party of the North, which was loudly demanding peace at any price. It would also give Virginia a chance to rest



ROBERT E. LEE
Commander of the Confederate Army.

from the ravages of war, and if successful it might win some of the European nations to recognize the Confederacy as an independent nation. The time seemed ripe for the undertaking. The armies of the North were not in good condition. The terms of enlistment of many of the men had expired, and the commander of the Federal troops, General Joseph Hooker, already discredited by his defeat at Chancellorsville (May 1863), had resigned just a few days before the battle of Gettysburg as the result of a disagreement with the administration at Washington; General Meade was but newly appointed to take his place.

For two weeks General Lee had carried all before him. His troops had begun to cross the Potomac on June 15; they had marched through Maryland, entered Pennsylvania, and were advancing upon Harrisburg,

the capital of the Keystone State. For a time Northern leaders feared an attack on Washington, but when it became evident that invasion of Pennsylvania was Lee's object, Meade followed in hot pursuit.

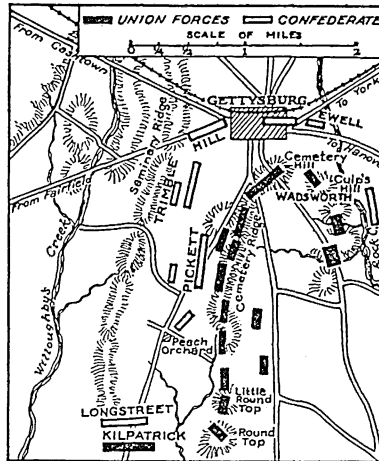
Advance parties of the Confederate and Union forces met in conflict on July 1. Some of the Confederate troops were on their way to the village of Gettysburg to get the shoes of which they were sadly in need. There they met a detachment of Union troops, and the battle began. Success was with Lee's men on that first day. They drove the Federal forces back through Gettysburg, and captured their positions on Seminary Ridge. Meade meanwhile posted his main forces on Cemetery Ridge and next day Lee attacked each flank in turn. He won ground but his successes were not decisive. On July 3 therefore he staked all upon one grand attack against the center.

On the afternoon of July 3, the flower of the Confederate army, 15,000 strong, led by Pickett's division, advanced to the assault, a solid wedge of men. "Regiment after regiment and brigade after brigade moved from the woods. The red flags wave, their horsemen gallop up and down; the arms gleam in the sun, a sloping forest of flashing steel." A mile across the valley lay the Union troops, calmly awaiting the coming storm, while over their heads their artillery poured a hail of shot and shell into the advancing ranks of the enemy. Pickett's men were mowed down like grain. Great gaps appeared in their lines, but these were immediately closed. Their thinning ranks swept on until a small remnant, led by the gallant Armistead, crossed the Federal lines on the crest of Cemetery Ridge. The Stars and Bars waved over the Union defenses. But the price had been great:

A thousand fell where Kemper led;
A thousand died where Garnett bled;
In blinding flame and strangling smoke
The remnant through the batteries broke
And crossed the line with Armistead.

The few who remained could not hold what they had won at such a terrible cost. Attacked on all sides

THE CLIMAX OF GETTYSBURG

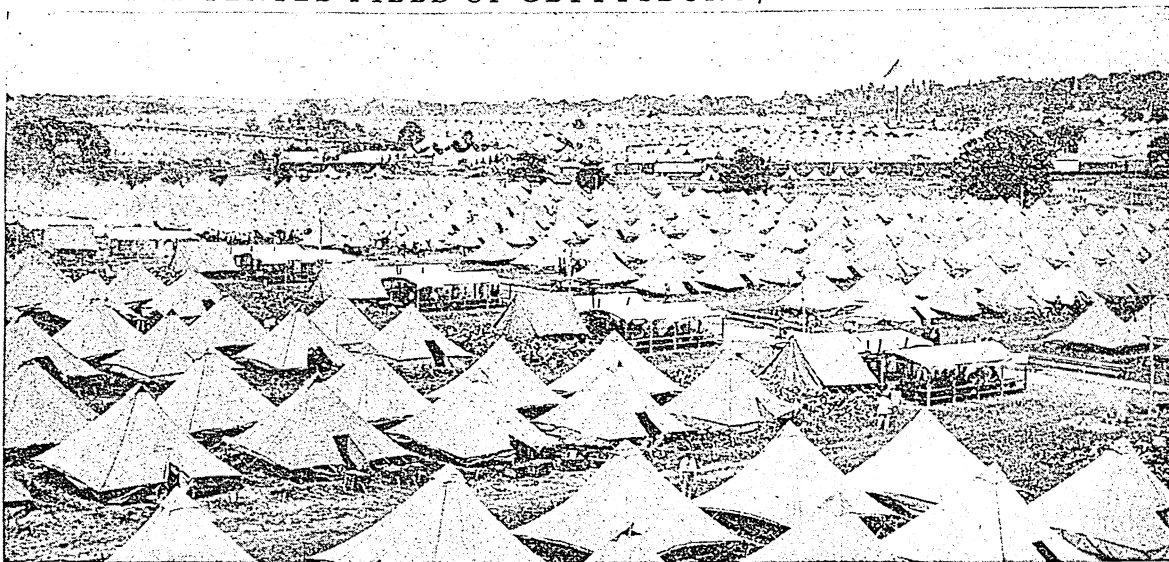


After unfruitful attacks on Round Top and Culp's Hill on July 2, Lee sent his assaulting columns, led by Pickett's division, against the Federal center on Cemetery Ridge on the afternoon of July 3. When this attack also failed, Lee accepted defeat and withdrew from Northern soil.



GEORGE G. MEADE
Union Commander at Gettysburg.

THE TENTED FIELD OF GETTYSBURG, 50 YEARS AFTER



This city of tents is the temporary home of thousands of old soldiers of the Civil War, the "Blue" and the "Gray" together. These men, who years before were locked in deadly battle on the same field, met in friendship to help celebrate the 50th anniversary of the battle of Gettysburg, July 1 to 4, 1913. More than 7,000 tents were pitched on the field, a convincing testimony to the completeness with which the wounds of the Civil War had healed.

they threw down their arms and fled. Lee's great assault, one of the most desperate charges in all history, had failed.

There was nothing left for the Confederates but retreat. Slowly, on July 4, Lee gathered his men about him and started on the way back to Virginia. If Meade's army had not been worn out by the three days' fight it might have ended the war then and there. But Meade felt that his battered men were in no condition to pursue, and Lee was allowed to recross the Potomac in safety.

The Turning Point of the War

The battle put an end to Lee's hopes of invading the North, and it did far more. Up to that time, some political leaders of England had been strongly inclined to recognize the Confederacy as an independent nation; but when the news of Gettysburg flashed over the world, it put a halt to such projects.

Thus the turning point in the war was reached with the victories at Gettysburg and Vicksburg, which occurred at the same time. The struggle continued for nearly two years longer, and was marked by terrible battles; but from this time the strength of the Confederacy steadily declined, while the power of the Federal government as steadily increased.

Today the little town of Gettysburg stands in the midst of the silent memorials of the battle which raged near it during those three days. A national cemetery, containing the graves of 3,629 soldiers, was laid out on Cemetery Hill, and at its dedication on November 19, 1863, President Lincoln delivered his famous Gettysburg Address. In 1895 the whole battlefield became a national park, within which are over 2,000 monuments, markers, and tablets, erected

by states and regimental associations to show the visitor the spots where the different troops took part in this great conflict. In the World War it was taken as a training ground for the Tank Corps, and sons of the South and the North, now in the same uniform and under the same flag, camped where their forefathers had fought and fallen.

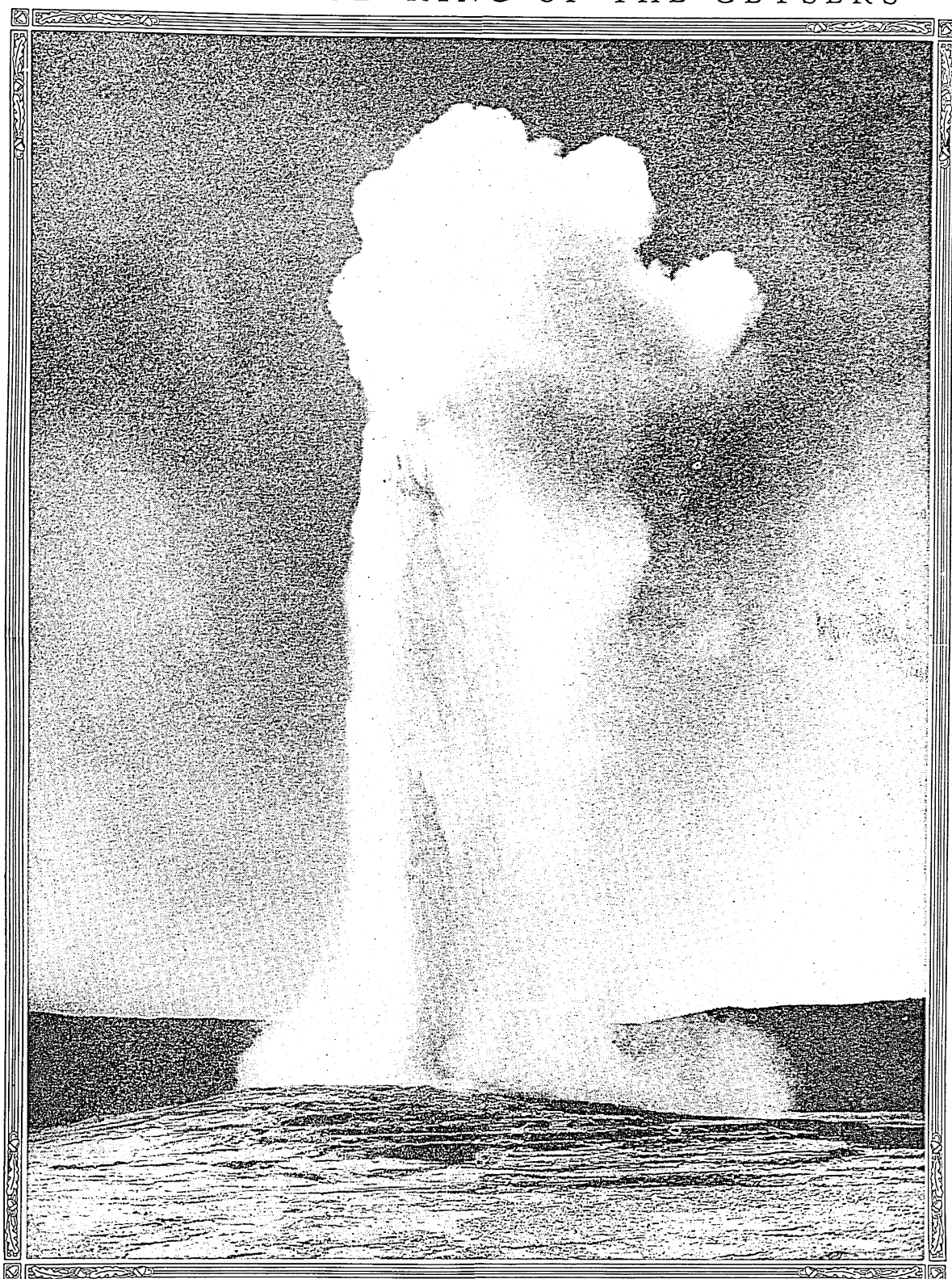
GEYSER. A hot spring which breaks forth in an eruption every now and then is called a geyser. Geysers occur in certain regions of the earth which were formerly volcanic and which have retained considerable heat near the surface.

A typical geyser consists of a crater with a funnel-shaped opening into the earth. From this opening, at fairly regular intervals, a column of hot water and steam is ejected, sometimes to the height of a few feet, and others to a height of 250 feet, as in the case of the geyser known as the Giant in Yellowstone Park. Until about 1870 Iceland was considered the principal seat of geysers, but we now know that Yellowstone Park contains more geysers than all the rest of the known world. New Zealand also has some noted geysers.

What Makes a Geyser Spout?

The theory of Robert Bunsen, with slight modifications, is the generally accepted explanation of geyser action. This theory depends on the well-known fact that the boiling point of water rises with the pressure, and is therefore higher at the bottom of a long tube of water than at the surface. Because the geyser tubes are narrow or irregular, the temperature of the water cannot be equalized by convection currents. The expansion of the water in the bottom of the tube gradually raises the water level, and finally causes an overflow. The pressure is thereby reduced,

OLD FAITHFUL—KING OF THE GEYSERS



Most famous of the Yellowstone Park geysers is Old Faithful. It gets its name from the fact that its eruptions are frequent and fairly regular, whereas the other large Yellowstone geysers play irregularly and at intervals of several hours or days. Old Faithful erupts usually after an interval of about 65 minutes, though the time varies from 38 to 81 minutes. It sends a jet of boiling water to a height of from 120 to 170 feet. The cone is built up of minerals deposited by the water as it cools.

the superheated water flashes into steam, and the force of the steam throws the column of water into the air and produces a geyser eruption.

When the erupted waters cool and evaporate, silica and other minerals are deposited. Thus in time remarkable rock formations of great beauty are built up about the geyser openings.

Ghent (*ġěnt*), BELGIUM. "It is the soul of Flanders, at once venerable and young. In its streets the past and present elbow each other." Thus the Belgian writer Maeterlinck describes Ghent, a thriving modern town which has yet many remnants of old-world charm. In it are the famous Cathedral of St. Bacon, a number of old guild houses and monasteries, and a nunnery founded in the 13th century, surrounded by walls and moats, and resembling a miniature town. In the center of the city the belfry still stands in which used to hang the bell "Roland" that called the citizens of Ghent to arms on the approach of enemies. There is much to remind the visitor of the medieval days when the city was the center of a great cloth industry and the home of the turbulent and wealthy burghers—"the sovereign town of Flanders for power, counsel, lordship, situation, and all that one can imagine as belonging to a good and noble town."

Ghent is a picturesque city, with a network of canals spanned by more than 200 bridges. Only eight miles in circumference, it contains extensive promenades and gardens and is sometimes called the City of Flowers. Situated where the Lys and Scheldt rivers meet, and connected with the ocean by a ship canal, it has considerable commerce in agricultural and manufactured products in addition to a large export trade in flowers. Though not so conspicuous for manufacturing as in the Middle Ages, it has many important industries. Chief among the city's enterprises are cotton-spinning, flax-spinning, cotton-printing, tanning, and sugar-refining.

The early history of Ghent is the usual history of Flemish towns—an endless series of quarrels between the townsfolk and their lords, between the aristocrats and the bourgeoisie, and against the rival city of Bruges. Two of the most famous of the insurrections were those led by Jacob Van Artevelde and his son Philip in the 14th century. Population, about 165,000.

Ghiberti (*ġĕ-bĕr'lē*), **LORENZO** (1378–1455). In the year 1403, in the beautiful Italian city of Florence, 34 judges sat with puckered brows vainly trying to decide which of two models for a pair of bronze doors was the more beautiful. The models were the best of those presented in a competition held to decide who should make the new doors for the Baptistery of Florence, a building which had once been the cathedral of the city, but which was now used chiefly for baptismal services. But the judges' brow-puckering did no good, for they could not decide which of the models should have the prize.

Then one of the young sculptors, Brunelleschi—he who a few years later left sculpture for architecture

and constructed the wonderful dome of the great new cathedral near by—stepped forward, and, saying that his rival's model was more beautiful than his own, withdrew his design from the competition. The young man whose work so impressed his big-hearted rival was Lorenzo Ghiberti, and the bronze doors which he executed when he had thus won the competition are among the many beautiful works of the Renaissance.

But far surpassing these in beauty and difficulty of casting are his marvelous second pair of doors for the Baptistery, executed by this great Florentine artist some years later. On these Ghiberti worked for more than 25 years. The subjects of their sculptures are stories of the Old Testament, and in some of the ten panels are as many as a hundred separate figures, modeled upon different planes in accordance with the newly studied laws of perspective. In the first are pictured the creation of man, the creation of woman, and the expulsion from Eden; in the second, the sacrifice of Abel, with Cain's oxen plowing in the foreground. Other panels picture the story of Noah, of Abraham, of Jacob and Joseph, of Moses, Joshua, David, and Solomon. Only less beautiful than the figures and background of these marvelous doors is the border of statuettes and busts surrounding each and the decorative frieze of fruits and birds and beasts that frames the whole.

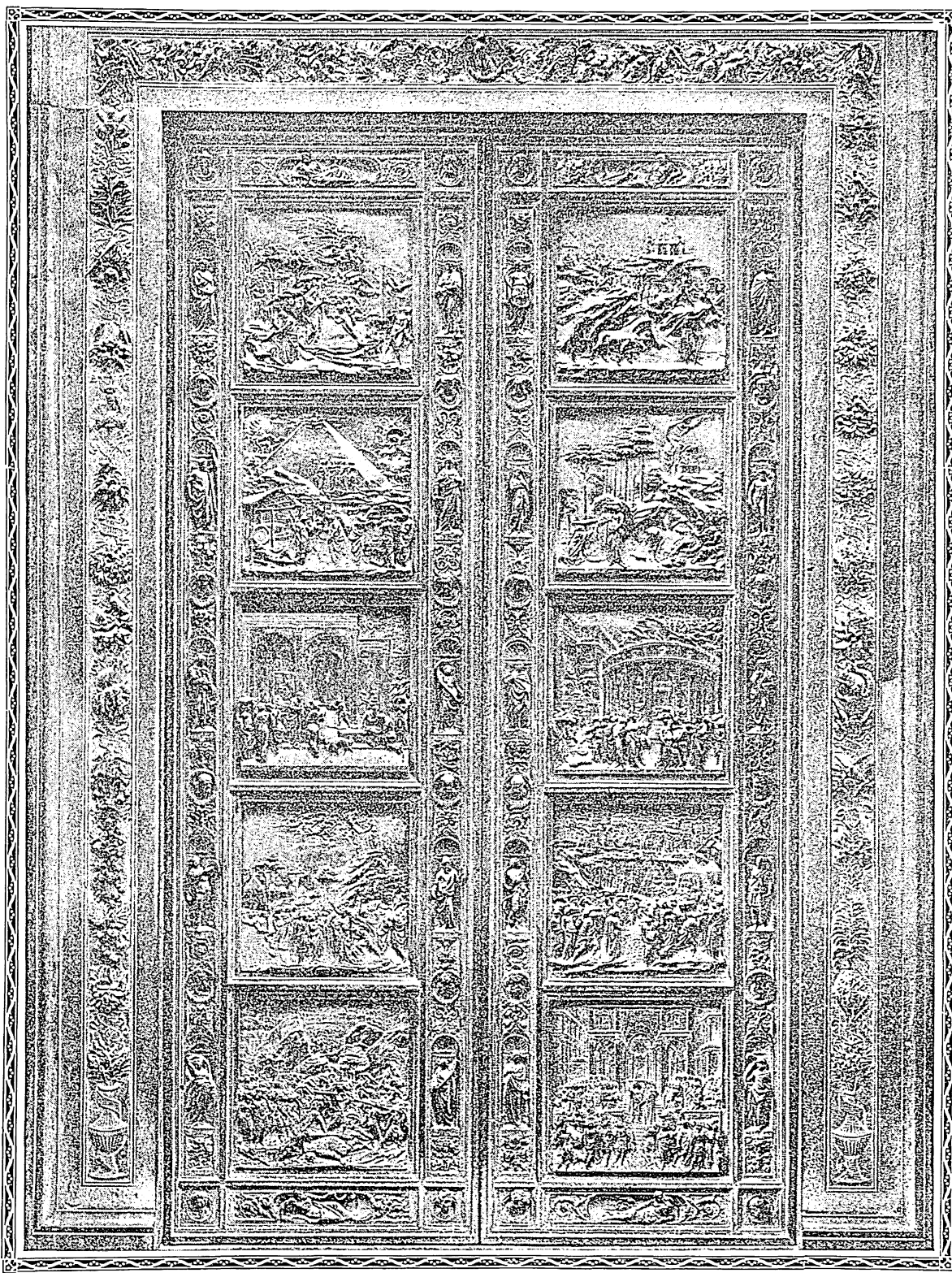
The great Michelangelo, a hundred years later, being asked what he thought of these doors replied: "They are beautiful enough for the gates of Paradise."

Ghiberti's early training, like that of many other artists of the Italian Renaissance, was as a goldsmith, and the skill in minute detail which he thus learned never deserted him. When at 25 he was given the commission to execute his first pair of doors, several assistants were given him, among others his stepfather, also a goldsmith. The stories told in it are stories of the life of Christ and of the fathers of the church, and the modeling and casting took 21 years. All the people of Florence took the keenest interest in Ghiberti's work, paying patiently large sums of money for 50 years out of their taxes, and watching the designs grow with interest that never failed.

The double character of the Renaissance—enthusiasm for antiquity and enthusiasm for visible nature—are both shown very clearly in Ghiberti's second pair of doors. Ghiberti also executed several statues and reliefs and designed some of the most beautiful stained glass in the cathedral of Florence. He died at 77 years, full of honor and piety, caring nothing for money but only for his art and the religion it had been used to beautify.

GIBBONS, JAMES, CARDINAL (1834–1921). The second American to be made a cardinal of the Roman Catholic church—the first being Cardinal McCloskey of New York—was James Gibbons, one of the outstanding figures in American public life. Born in Baltimore on July 23, 1834, he was taken by his parents to Ireland where he obtained his childhood education. He returned in 1848, living for a time in

THE MOST FAMOUS DOORS IN THE WORLD



This second set of bronze doors made by Ghiberti for the Baptistery of Florence are regarded as among the world's greatest masterpieces. "They are beautiful enough for the gates of Paradise," said Michelangelo when he saw them for the first time. Ten stories from the Old Testament are illustrated in those panels, and the details of the figures, the perspective, and the decorations are worked out with exquisite accuracy and grace. It was Ghiberti's early training as a goldsmith joined to his genius as a sculptor which enabled him to achieve such delicate beauty.

New Orleans. He was graduated from St. Mary's Seminary, Baltimore, and ordained a priest in 1861.

In 1866 he was appointed first vicar-apostolic of North Carolina with the rank and title of bishop. His work was marked with a thoroughness and success which led to his promotion to the see of Richmond in 1872. Here his zeal and ability were further demonstrated, and in 1877 he became coadjutor to Archbishop Bayley. On the death of the latter in the same year, Bishop Gibbons became archbishop of Baltimore. He presided at the plenary council of Baltimore in 1884, and Leo XIII, approving of the acts and decrees of this council, created him cardinal in 1886. In this high office he showed the qualities of a wise and able prelate, and gained wide influence, not only as a leading churchman but as a progressive and patriotic citizen.

GIBRALTAR. Like a reclining lion dozing in the southern sun, the great rock of Gibraltar looks sleepily across the 12 miles of water which separate this southernmost point of Spain from Ceuta, on the African side of the strait leading into the Mediterranean.

But in case of need this peaceful-seeming rock can leap into thunder and flame from powerful cannon which lie hid in many a waterside or rock-hewn battery. For Gibraltar for over 200 years has been a garrison and crown colony of Great Britain, her chief naval base on the Mediterranean route to India. The fortifications are so strong that the rock is considered impregnable. The eastern side is so steep as to be altogether secure from assault.

Gibraltar lies at the end of a low sandy peninsula, about three miles long and half a mile in average width. The rock itself rises to a height of 1,408 feet. Its western side is washed by the Bay of Gibraltar, where at the foot of the rock lies the city of Gibraltar,

THE FROWNING GUARD AT THE GATE OF THE MEDITERRANEAN



This is the Rock of Gibraltar that looms above the narrow western entrance of the Mediterranean. Its peak is 1,400 feet above the sea, and hidden in its rugged sides of pale gray limestone are countless great British guns, commanding the 12-mile passage which separates Europe from Africa. Europa Point, on which the lighthouse stands, is the most southerly projection of the rock. The public gardens, the barracks, and the docks are situated on the Atlantic side.

JAMES CARDINAL GIBBONS



Famous American Churchman and Public Leader.

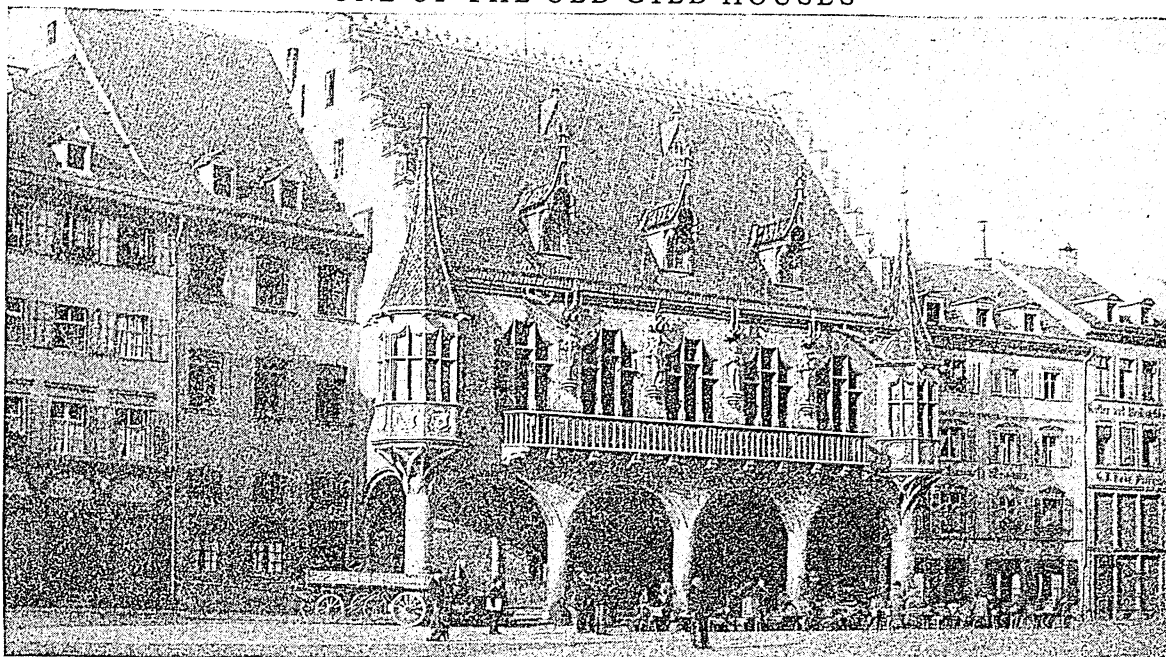
with a population of about 25,000, including the garrison of between 5,000 and 6,000 men. Aliens are not allowed to reside in Gibraltar without a special permit

from the British authorities, and every effort is made to prevent the increase of population. At the northern end of the rock is an open space, part of which, lying between the British and the Spanish lines, is called the "neutral ground" and is uninhabited. Six miles across the bay from Gibraltar lies the Spanish town of Algeciras, where an international conference on Moroccan affairs was held in 1906.

Gibraltar, with its opposite African cape (where lies the Spanish town of Ceuta), was called by the Greeks the "Pillars of Hercules" and was once thought to be the western limit of the world. Gibraltar takes its name (Jebel-al-Tarik, "hill of Tarik") from the Mohammedan chief who led his troops across the straits in 711 A.D., captured it, and built a fortress there. In 1704 it was captured from the Spaniards by the British, and has remained in their possession ever since. It has endured many sieges, especially the great one of 1779-83, when for four years the garrison held out against

a joint besieging force of French and Spaniards. This is regarded as one of the most memorable sieges of history. The culminating episode was the grand attack in September 1782, by a fleet especially equipped with massive wooden armor. Every attacking ship was finally blown up or burnt to the water's edge by cannon-balls heated red hot and fired from the Gibraltar batteries.

ONE OF THE OLD GILD HOUSES



Here is a fine example of one of the old gild houses, the Kaufhaus, or Merchants' Hall, in Freiburg, Germany. The gilds built such halls to serve as meeting places and headquarters, and made them as handsome as their prosperity would permit.

GILDS. In every important town of Europe during the Middle Ages the men of each trade were organized into associations known as craft gilds for the purpose of regulating their occupations and preserving a monopoly. The weavers seem to have been the first to organize, but later the goldsmiths, saddlers, fishmongers, bakers, dyers, glove-makers, and many other occupations, some with only a handful of workers, formed separate fraternities. In the larger cities like Paris and London there were in the 14th century as many as 50 or more different gilds. Usually they were authorized by the local governments, but sometimes they obtained a charter from the king.

The rules of the gild provided that no one who was not a member should practice the trade within the town. Membership in some places was acquired as a matter of course by any artisan who reached a required de-

gree of skill; but at other times and places it was jealously guarded, descending to sons or being obtained by marriage.

The gild regulations required that all articles made and sold by their members should be of a certain quality.

SHOPPING IN THE DAYS OF THE GILDS



Here my lord and his family are out for an afternoon of shopping. The merchant's apprentice is showing a fine piece of cloth and no doubt enlarging on its merits. My lord seems to be exclaiming at the price, while the merchant indicates by his fingers that he will reduce the price to this important customer.

There must be, for instance, according to the rules of the weavers' gild, a certain number of threads to the inch in standard cloths. The hours of labor were regulated, and work on holidays and at night prohibited. In later times insistence on outworn standards and processes became a handicap in industry, and led to a shifting of manufactures to villages and new towns where gilds were not established.

Other gild regulations provided for mutual assistance, the care of sick and needy members, and of members' widows and orphans. Once a year—sometimes oftener—the members gathered for a feast (the word "gild" means "feast" or "payment")

and in summer, usually on Corpus Christi day, they often gave one of the miracle plays popular at the time (see *Miracle Plays*). Since the members of a craft usually lived on the same street, the craft gild was a natural center for the interests of its members.

Membership in a gild was ordinarily obtained by passing through an apprenticeship. The young craftsman was bound out by his parents to an employer for a number of years—usually seven—during which time he was fed and clothed and lodged with the master's family, above or behind the shop. When his apprenticeship was finished he became a "journeyman" (so called from the "wander year" in which he perfected himself in the craft by working about in other cities), and served for wages and worked for whomever he pleased. If he were ambitious and saved enough of his wages to start a small shop of his own, he might possibly become a master, with journeymen and apprentices under him, and could then take part in all of the meetings of his craft and hold office.

In addition to the craft gilds there were older and more powerful organizations called "merchant gilds," composed of men who made a business of buying and selling and engaged in what we should call wholesale trading to distant places. It was members of such organizations who formed the great Hanseatic League that was such a power in the Baltic lands, and even had quarters in the steelyard of London. On the continent the merchant gilds had a great influence in the city government, and the gild hall of the merchants is today one of the striking buildings in many a European city. Many non-industrial gilds existed, mostly founded for charitable and religious purposes.

GINGER. The history of ginger goes back to a remote period in India. The Greeks and Romans imported it, and during the Middle Ages it was next in value to pepper, a pound costing as much as a sheep. It was the first of the oriental spices to be grown in the New World, and as early as 1550 Jamaica exported a large amount to Spain. It is an important commercial crop in India, China, West Africa, in the West Indies, and in Central America. Jamaica ginger is the finest and most valuable.

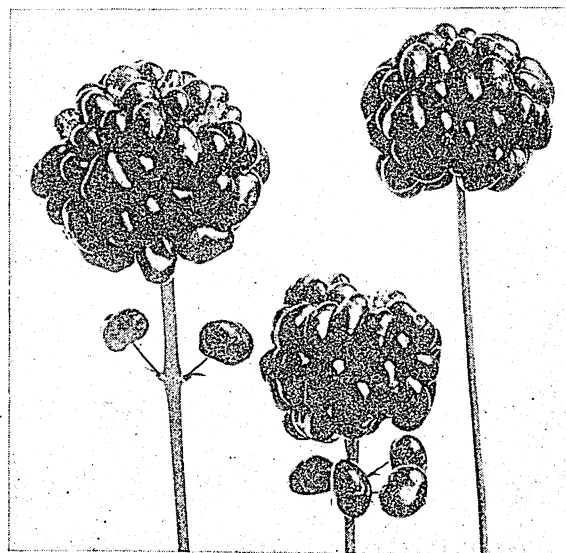
Ginger spice is made from the root-stocks of a perennial reedlike plant, similar in appearance to our iris or flagroot. Ginger is marketed in two forms, preserved or green ginger, and dried or cured ginger. China supplies practically all of the preserved ginger, which is prepared with sugar syrup or honey. For dried ginger the root is dug out after the leaves of the plant have withered. When the skin is left on it is known as "black ginger"; when it has been removed before drying, it is "white ginger." The essence of ginger used in flavoring is a tincture of ginger and alcohol.

Scientific name of common ginger plant, *Zinziber officinale*. The plant usually grows to a height of about two feet. The flowers are yellowish-white and fragrant. Another important member of the ginger family is *turmeric*, whose powdered roots are used as a yellow dyestuff, as a condiment (especially in curry powder), and in medicine.

GINKGO (*gink'gō*). This peculiar tree, native to China and Japan, is the sole survivor of a genus once widely distributed over the world. Its fernlike leaves have given it the English name, "maidenhair tree," and the beauty of its foliage has caused its adoption as a shade tree in many sections, especially in Washington, D.C., where it is extensively planted along the streets and in the parks. The ginkgo is a graceful tree, with numerous slender branches, which form a cone-shaped head. The fruit, about the size of a small plum, has a disagreeable odor and falling makes an unsightly litter on the walks and lawn, which probably accounts for its not being more widely cultivated. The kernel of this fruit is edible and when roasted has a taste like maize; it is used as a food by the Chinese and Japanese. The ginkgo is not known in a wild state, having been preserved from extinction by its cultivation in the temple grounds of China and Japan, where it is considered a sacred tree.

GINSENG (*gin'sēng*). Many are the tales the Chinese tell of the wonderful cures that ginseng has wrought. They will tell you that its roots are a remedy for every illness, that they are able to prolong life and even to

SCARLET BERRIES OF THE GINSENG

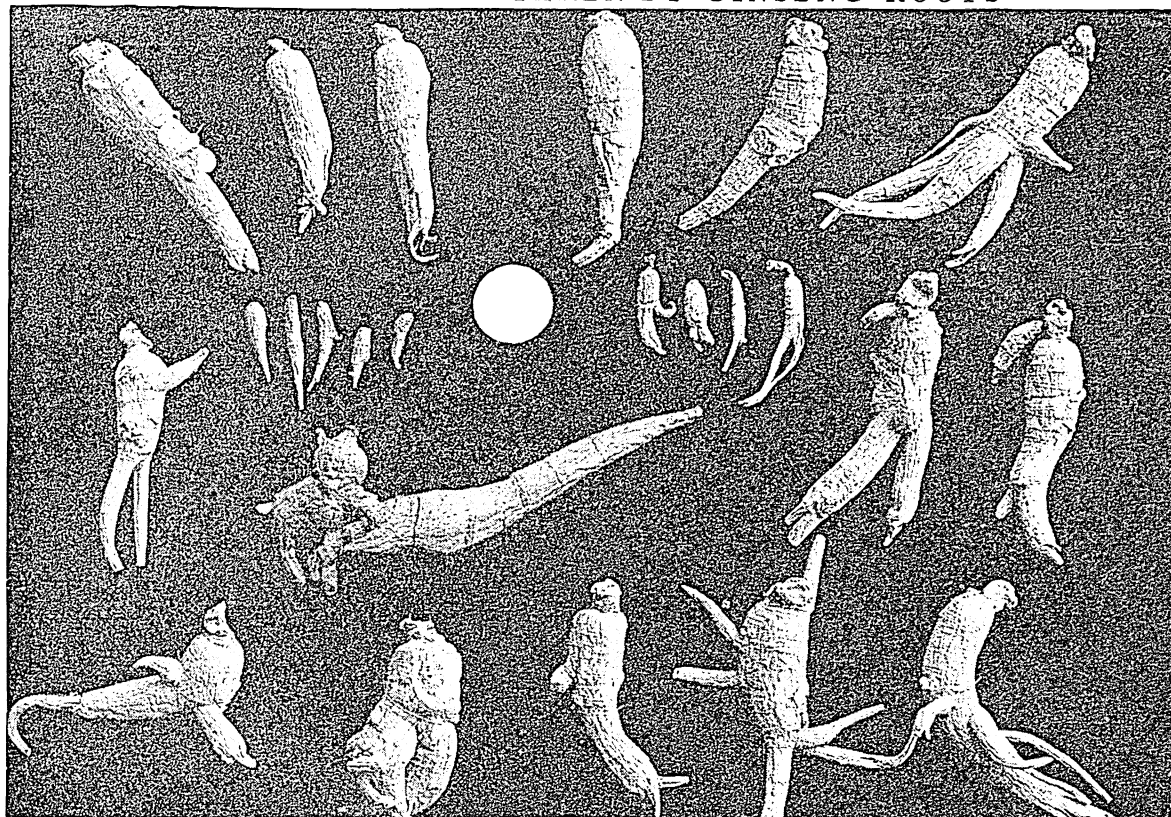


If you should see in the woods clusters of scarlet berries like these you will know that beneath them in the ground are the roots which the Chinese prize so highly as medicine.

restore it after death; and their legends recount how the wolf, tiger, and snake protect this miraculous plant from harm, and how the roots save themselves from capture by moving from place to place underground. And so, although our own physicians regard it as of little value, the Chinese still buy it at any price. Many country boys keep their eyes open in summer for the three-leaved stalks and scarlet berries growing in the deeper woods, and sell the small parsnip-like roots for three or four dollars a pound.

The most valuable ginseng—sometimes worth \$200 an ounce—comes from Korea or Manchuria, and an

CURIOUS SHAPES TAKEN BY GINSENG ROOTS



This ginseng is ready for market. The size of the roots is indicated by the white circle which represents the comparative size of a silver dollar. The nine smaller samples near the circle are specimens from an Oriental dealer, and show the kind of roots his trade demands. Those with "human" forms are the most valuable.

inferior quality is cultivated in Japan. It was first discovered on the American continent in Canada, and later was found to be growing in eastern United States. Most of the wild ginseng has now disappeared, and a cultivated plant is taking its place. But the wild variety always commands better prices because of the Chinese superstition which prefers roots resembling a man or some grotesque being (gin-seng means "form of man") rather than the regular roots which cultivation tends to produce.

Ginseng belongs to the genus *Panax*. *Panax ginseng*, a native of China, and *Panax quinquefolium*, of eastern North America, are the most noted species.

GIOTTO (göl'to) (1267?-1337). An enchanting bell-tower of variegated marble piercing the skies of Florence with restrained ethereal grace, its surface adorned with beautifully pointed windows, slender columns, exquisite statues and reliefs—this is the world-famous "campanile" of Giotto di Bondone, the great Italian artist who stood at the dawn of the Renaissance. It is impossible to overestimate the beauty of this square tower of red, black, and white marble, rising in five stories over 275 feet—all of it Giotto's design and part of it (such as the first course of sculptured medallions, a wonderful series representing primitive arts and industries) actually the work of his own hand.

No wonder a Florentine's expression for perfect beauty runs, "as beautiful as Giotto's tower!"

But it is as a painter and not as a sculptor or architect that Giotto is perhaps best known in the world. Born in Vespignano, a few miles north of Florence, he early showed his artistic ability. The story is told that Cimabue, "the father of painting," discovered him as a boy of 12 drawing one of his father's sheep on the ground with a pointed stone, and, attracted by his talent, made him his protégé and pupil. Soon he began to adorn church walls with wonderful "frescoes" of saints and biblical characters painted on the fresh-laid plaster—pictures that in those days served as a people's Bible. His earliest works are at Assisi, the birthplace of St. Francis, in whose church he painted some scenes in the life of that most lovable of saints. Later the pope called him to Rome, ordering a series of mosaics and paintings. These Giotto so beautifully executed that soon dukes, princes, and kings competed for his services.

There is an oft-told story of how Giotto sent the pope a specimen of his work. "Giotto took a sheet of paper and a pencil dipped in red color, then resting his elbow on his side to form a sort of compass, with one turn of his hand he drew a circle so perfect and exact that it was a marvel to behold." Thus orig-

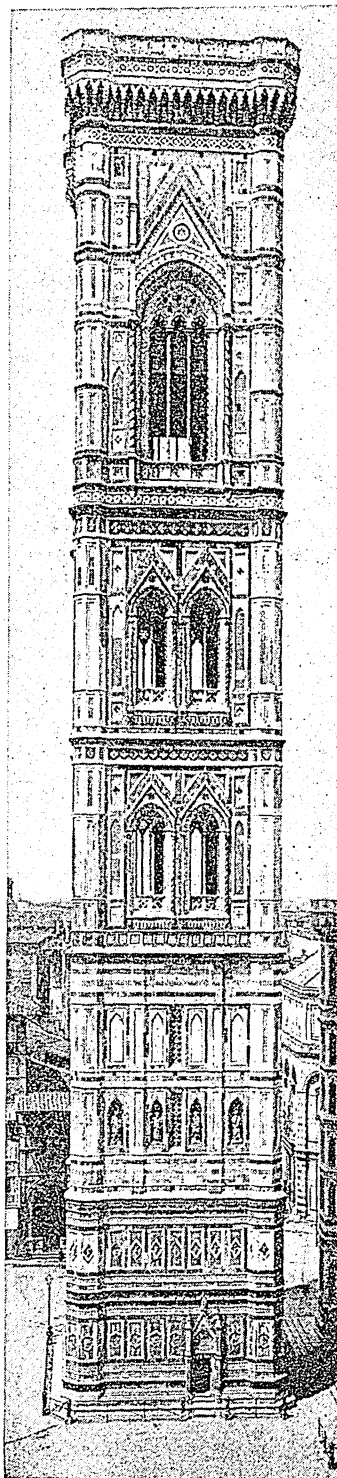
inated the Italian phrase, "as round as Giotto's 'O'."

Giotto's life was crowded with work. The great poet Dante was his friend and helped him choose subjects for many of his paintings. In the Palace of the Podesta at Florence is a series of Biblical scenes painted by Giotto, and among the bystanders he gives us portraits of Dante and Brunetto Latini, Dante's teacher. For centuries whitewash overlaid these frescoes, but in 1841 fragments were recovered and freely "restored." In the 38 masterly paintings of the life of Christ and the Virgin, of the Last Judgment, and other Biblical scenes which Giotto executed for the Arena Chapel in Padua he reached the supreme height of his genius. Giotto's frescoes indeed are found in almost all large Italian cities, some of the most superb being those in the Church of Santa Croce, Florence.

Giotto's last years were spent in Florence as chief architect of the Florentine Cathedral and in working on his campanile, both of which were left unfinished at his death in 1337. He was buried in the cathedral with great honors. Over a century later Lorenzo de' Medici erected a fine monument to him with an epitaph which truthfully says: "Lo, I am Giotto—what need is there to tell of my work? Long as verse lives, my name shall endure!"

Among the most famous of Giotto's paintings are his passionate and dramatic 'Death of St. Francis' and 'Ascension of St. John', in the Church of Santa Croce, Florence; his portrait of Dante, also in Florence; his 'Christ before Caiaphas', and his simple and beautiful 'Visitation of Mary to Elizabeth', in Padua. These and others of his paintings reveal to us the simple original genius of the greatest painter Italy produced before the flowering of the Renaissance, an artist who despite his lack of knowledge of anatomy, and of technical laws of perspective, foreshortening, etc. (to which art had not yet attained), was yet the first to get away from the old conventional ideals of his time, and to paint with deep feeling and dramatic skill real people in real attitudes.

GIOTTO'S TOWER



"An enchanting bell tower of variegated marble piercing the skies of Florence, its surface adorned with beautifully pointed windows, slender columns, statues and reliefs—this is the world-famous campanile of Giotto, the great Italian artist."

GIPSIES. The untamed, nomadic race called gipsies has kept alive a tradition that goes back to the days when our own ancestors were wandering tribesmen on the plains of Europe and Asia. And the instinct that still makes the hearts of settled people yearn sometimes for far horizons sharpens our interest when we see a carefree gipsy caravan moving along a country road.

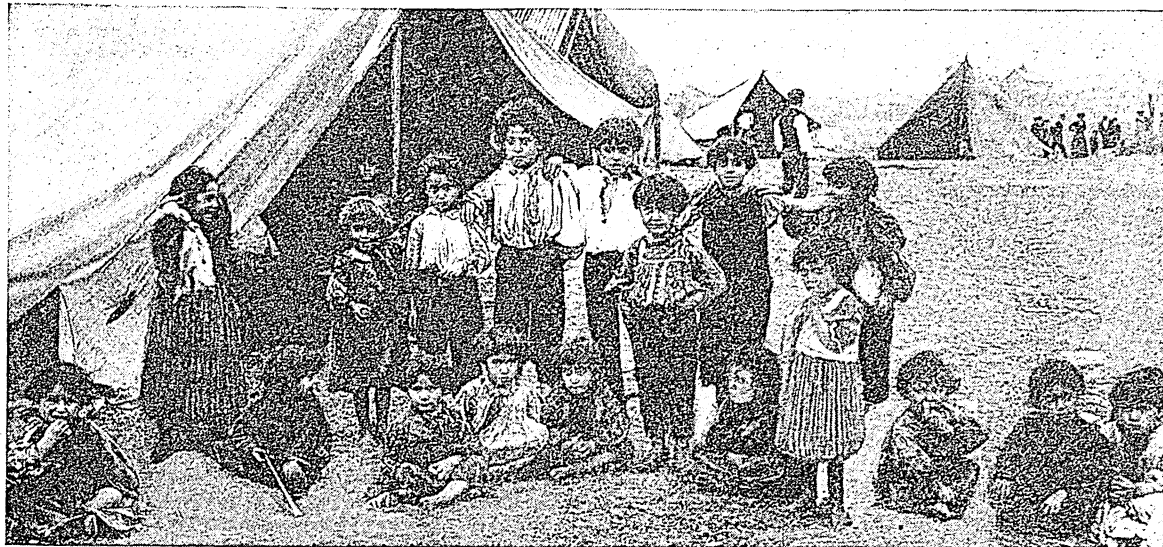
Gipsies have naturally delighted the souls of artists. Though they have no literature of their own—except for a few stories and songs—their figures have enlivened the literatures of many lands, where they appear as romantic dwellers on the heath, or as impudent beggars, lawless vagabonds, and crazed witches. In music, the soul of the gipsy has found its fullest expression. Liszt, in his 'Hungarian Rhapsodies', tried to catch the wild gaiety and haunting sadness he had heard around the gipsy campfires (see Liszt, Franz). Some authorities believe that much Rumanian and Spanish music, as well as Hungarian, is of gipsy origin or was strongly influenced by gipsy music.

Since they have no written records, the gipsies do not know who they are or where they came from. They like to be called Egyptians, but their language, now divided into many dialects, had its origin in India. They probably originally left India to escape the horrors of war, perhaps at the time of Alexander the Great. Later, apparently fleeing from the Turks, they appeared in Germany about 1414, and then spread over western Europe. Their language contains numerous words borrowed before that time from the ancient Slavic, Greek, and Armenian. They call this language Romany, from the gipsy word *rom*, meaning man. Other languages have adopted a number of Romany words, but usually as slang, such as *pal* (comrade) in English.

How the Gipsies Live

The gipsies' way of travel was in vans or wagons, packed with goods, utensils, children; and pet dogs. As strangers and wanderers, they were met almost everywhere with suspicion, and at times with persecution

LIFE IS CAREFREE IN A GIPSY CAMP



A happy lot, aren't they, these gipsy children? This photograph was taken in a gipsy camp in England, and shows their happy-go-lucky way of living. A number of families will travel about, pitch their tents on commons near towns and villages, and earn money by horse-trading, mending cane chairs, telling fortunes, and doing odd jobs of tinkering.

and death. Their appearance, their habit of fortune-telling, and their strange customs and ceremonies made people fear them. It is now known that their magical ceremonies—for example, at births, marriages, and funerals—are survivals of practises which were everywhere common among primitive peoples. Treated with hostility, the gipsies became stealthy, secretive, thieving, and unscrupulous in trades. Yet, because they were expert at treating sick horses, and were skilled metal workers, horseshoers, musicians, and circus entertainers, they were in time tolerated in most parts of the world. Anyone outside their own race who proved that he was their sincere friend found them genuinely loyal and affectionate. They are gay, kindly, and very fond of children; but quick to fight fiercely with knives if they believe themselves to be insulted in any way.

Modern Changes Among Gipsies

In America, nearly all gipsies now travel by automobile, but their way of life is otherwise much the same as before. Each group has its elected leaders, who in England and America are called kings and queens. When a new camp is made, the men put up the tents and set out baskets, rugs, or wooden articles for sale. The women and children tell fortunes or beg. Often the men mend pans, pots, and kettles.

No one knows exactly how many gipsies there are. Some groups are still almost pure, but many have mixed freely with other races. Perhaps 700,000 could be identified. Several countries—particularly Russia—have tried to merge them with the rest of the population. English schools established for them have not been successful, but at least one, at Uzhorod in Upper Hungary, has turned out well. In Rumania, the gipsies themselves, in a huge congress of the United Gipsies of Europe, held at Bucharest in November

1933, urged education and "civilization." Many of the 300,000 Rumanian gipsies have become farmers. In America there are still about 50,000 confirmed wanderers who do not try to live in houses.

Distinguished among the authors who have written about gipsies are George Borrow, whose two best books on this theme are 'Lavengro' and its sequel 'The Romany Rye'; W. F. Starkie, whose 'Raggle Taggle' is the story of a scholar-musician's wanderings with the gipsies; and Konrad Berco-vici, whose 'Story of the Gipsies' is based on what he learned at gipsy campfires in his native Rumania. So great is the interest of scholars and others in these world wanderers that a Gipsy Lore Society has been founded which publishes a journal and has branches in Europe and America.

GIRAFFE. It is not easy to imagine a more grotesque creature than this African animal. With a neck like a leaning tower and legs like stilts, it has been a subject for amazement and eager study since ancient times. It has puzzled zoölogists, who classify it somewhere between the deer and the antelope.

The giraffe towers above all other living animals; it may grow to be from 16 to 20 feet tall. It owes this height mostly to its legs and neck, for its body is smaller than that of the average horse. The front legs may be 8 or 10 feet long, and the neck as long as a tall man's body. The neck contains only seven vertebrae (the same number as in man), and it is so stiff that the giraffe must spread its legs far apart in order to reach the water, on the rare occasions when it drinks.

The feeding habits of the giraffe may explain why it has become so tall. It eats no flesh, and so depends mostly on leaves for food, because grass is scarce in the countries where it lives. Since the trees in these regions are almost bare of branches for some distance above the ground, the giraffe's long neck and long legs enable it to browse comfortably the tops of such trees. Its tongue is in keeping

with this purpose, for it often measures a foot and a half in length.

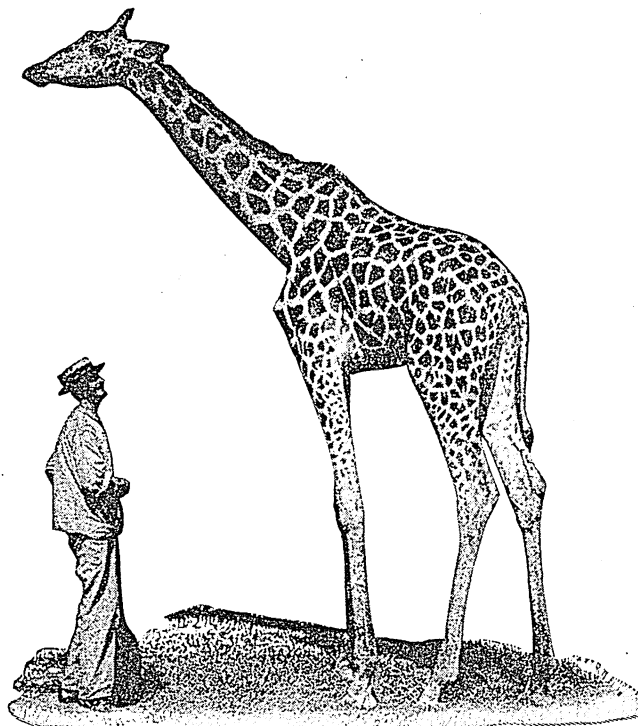
Having produced such a strange creature, Nature also undertook to "camouflage" it for protection by giving it a spotted skin of brown and yellow. As the giraffe stands among the mimosa trees (its favorite feeding place), its skin resembles the play of light and shadow through the leaves, so that it is exceedingly difficult to detect (see Protective Coloration).

The giraffe's back slopes downward from the shoulders to the tail; and its shoulder blades project at right angles to the body so that the chest is very much wider than the rump. The neck, which has a short soft mane, is surmounted by a delicate head. Between the ears are two bony horn-like projections covered with skin and each surmounted with a tuft of bristles. In front of and between these projections is a rounded bony elevation which appears like an undeveloped third horn. In one form both males and females possess horns; but usually the horns are confined to the males. The eyes of the giraffe are described as wonderful in beauty of coloring and in expression. The upper lip is long and is used, together with the tongue, in grasping food. The hoofs are cleft and dainty in shape. The knees and hock-joints are covered by callosities like those of the camel. The hide is thick and covered with short soft hair. The nostrils are prominent and can be closed at will like those of the camel.

The movements of the giraffe are as curious as its structure. It cannot trot, but it runs in a ponderous gallop. The Arabs hunt the giraffe with their fleetest horses and yet find difficulty in overtaking it. The flesh is in great demand for food, the skin is used for leather, and the tail-tuft is used for fly-brushes.

In their native state giraffes are usually found in small herds. They chew their cud while standing erect, and wary hunters have sometimes come upon specimens leaning against trees, fast asleep.

HE HAS THE LONGEST NECK IN THE WORLD



What an advantage the giraffe would have in a crowd! He could see over everybody's head. But his long legs and neck were not built for sightseeing, as much as to enable him to eat the foliage from trees, for he lives in a country where the grass is scarce or dried out by the intense heat, so he must dine on leaves. Can you imagine anything more awkward in appearance than this creature? Yet it can run very swiftly.

The giraffe is entirely without a voice. No one has heard it utter a sound even when wounded. But the sense of sight and hearing are acutely developed and it is very intelligent. Although it is good-natured and gentle, it will fight in self-defense and use both head and legs as weapons. The head on its long neck can be used like a sledge-hammer to deal heavy blows. It is said that in defense of her young a female

giraffe has been known to kill a lion.

Giraffes were known to the ancient Egyptians and Greeks, and many were exhibited in the old Roman games. They were thought to be a mixture of camel and leopard, and were called "camelopards"—a name which has clung to them in their scientific classification today.

The range of these animals formerly extended throughout the breadth of the African continent from the Indian Ocean to the Atlantic and in prehistoric times included even portions of Europe and Asia. But they are now confined to the plains of eastern Africa, between the Sahara desert and the valley of the Zambezi.

In the northeastern portion of the great forests of the Belgian Congo lives the okapi, a near relative of the giraffe. This animal was unknown to civilized man until 1900, when Sir Harry H. Johnston, the English naturalist and explorer, learned of its existence from Congo pigmies, and obtained an imperfect skin and two skulls. So elusive is this creature and so perfectly camouflaged that specimens are exceedingly rare. The purplish-red color of the okapi's body, with its striped black and white forelimbs and hindquarters, blends admirably with the vegetation.

The full-grown okapi is much shorter than the giraffe, measuring less than five feet from the shoulders to the ground. It has a short, stout neck and a deerlike head. The male has horns shaped like those of the giraffe. These animals feed on roots, stems, and leaves, pulling in the food with their long tongues. Their thick, tough skins enable them to pass unharmed through the jungle undergrowth.

The okapi and the giraffe are the only members of the family *Giraffidae*, and are ruminant (cud-chewing) animals. Scientific name of the giraffe, *Giraffa camelopardalis*.

SCOUTING *with* GIRLS *of* MANY LANDS

GIRL SCOUTS. When Lord Robert Baden-Powell organized the first Boy Scout troop in 1908, he had no idea that he was preparing the way for a world-wide program of scouting—a program in which girls as well as boys would take part (*see* Boy Scouts). But when, in 1910, he called the Boy Scouts to meet him in London he was faced by a small but determined group of girls who had accompanied their Scout brothers to the meeting. These girls insisted that they wanted to be scouts, too, so that they as well as their brothers could enjoy the scouting program of work and play.

With the aid of his sister, Miss Agnes Baden-Powell, he met the girls' demand by organizing the Girl Guides. The organization has since spread to many other countries, and more than a million and a half girls are benefiting by the persistence of that little group of English girls who made themselves

a place in the scouting program although they had not been invited! All the Girl Scouts and Girl Guides of the world follow substantially the same promise and laws. A Girl Scout's uniform is a passport of friendship in almost any country she may visit.

Mrs. Juliette Low, a friend of Lord Baden-Powell, carried the idea of Girl Guiding (or Girl Scouting, as it soon was called) to the United States and organized the first Girl Scout troop in her home in Savannah, Ga., March 12, 1912. Until her death in 1927, Mrs. Low gave generously of her time, money, and enthusiasm, first to develop Girl Scouting in the United



Hiking not only gives Girl Scouts healthy outdoor exercise, but also provides opportunities for observing nature and learning to find their way by the sun and stars.

States and later to make it more widely known throughout the world. Her story is told in a most interesting book, 'Juliette Low and the Girl Scouts'.

Thousands of American women have found fun, friends, and new interests by becoming leaders of Girl Scout groups. Girls and leaders work and play together, planning their activities as a group. The national organization offers special training courses to leaders and other women who are interested in working with girls the Girl Scout way.

The Girl Scout program is based on the things girls are most interested in and gives them an opportunity to learn much that they need to know if they are to live happy useful lives. It covers such general fields as health and the outdoors, homemaking, community service, and special interests such as writing, arts and crafts, or other hobbies. A Girl Scout knows how to combine real fun with worthwhile activities.

Girl Scouting activities are planned to meet the needs and interests of three age groups: girls from 7 to 10 years old (who are called Brownies), girls from 10 to 15, and girls over 15 years of age (called Senior Scouts).

The Brownies are organized in groups, each containing from six to sixteen girls. They go to camp just as their older sisters do. They make friends with the animals in the camp and watch the behavior of the turtles and the frogs and other water life. They learn to be helpful, picking up their toys and helping to set the table at home. They make up their own songs and stories

LEARNING HOMEMAKING AT CAMP



Girl Scouts make a game of their homemaker duties by helping one another. They win merit badges for cooking, laundry work, and similar tasks.

and dramatize them at the camp fire. When Brownies are 10 years old, they "fly up" to become Girl Scouts.

The Girl Scout from 10 to 15 learns the Girl Scout promise and laws and understands that she must make them a part of her life. She makes herself useful by packing Christmas baskets to be distributed by welfare organizations or by bringing gifts and a bit of cheerful song to shut-ins and old people. Many Girl Scout troops raise money to help flood sufferers and other victims of disaster. The Girl Scout goes camping and hiking. She knows trail signs to guide her in the woods and she learns to make herself comfortable with a minimum of equipment. She learns what food she should eat and how much rest she should have to keep herself healthy. She learns to carry herself well. She earns or saves money for a woods-green uniform.

The Senior Girl Scout who is over 15 years may continue with many of the activities of the younger Scouts, adapted to her own age level, but she may also follow up the more specialized interests that girls of her age often have. She may already be thinking about a position and she probably wants to discover how she may take her part in a wider social life with poise and graciousness. Her Scout troop helps her to face the changing conditions of modern life by awakening her to the problems of citizenship, and by offering her opportunities to develop leisure-time hobbies and to learn the requirements of some of the kinds of work open to women.

Girl Scouts, 10 to 15 years old, attain three ranks—Tenderfoot, Second Class, and First Class. While advancing in rank, girls earn proficiency badges for activities in ten program fields: out-of-doors projects; homemaking; international friendship; arts and crafts; community life; sports and games; nature; health and safety; literature and dramatics; and music and dancing.

All Girl Scouts are members of an international organization, "The World Association of Girl Guides and Girl Scouts." Through the international letter box, Girl Scouts in the United States correspond with groups in other countries. By thus learning about

their sister Scouts they promote international good will.

Each year, except when war makes it impossible, some Girl Scouts from the United States are sent to "Our Chalet," the permanent international meeting place of the Girl Scouts at Adelboden, Switzerland. There they make friends with Guides and Scouts from other countries and lay the basis for future international understanding. "Our Chalet" is a gift of Mrs. James J. Storrow of Boston; the annual meetings there are financed by the Juliette Low Memorial Fund, set up in memory of the founder of Girl Scouting in the United States.

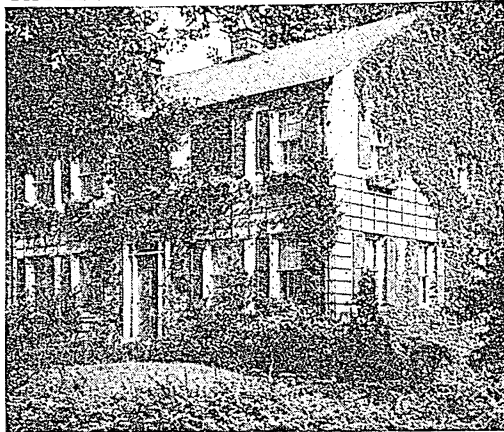
Girl Scout troops are usually divided into patrols of from four to eight girls. These patrols plan special activities and elect a patrol leader who meets with the other patrol leaders, the troop scribe, the troop treasurer, and the troop captain and her lieutenant to plan the program of the troop as a whole. The troops generally meet once a week.

During the summer many girls go to one of the numerous Girl Scout camps that are scattered through the country. It is hoped that ultimately every Scout will have at least two weeks each year in camp.

There are more than half a million Girl Scouts in the United States, including Brownies. Each Girl Scout pays fifty cents a year for

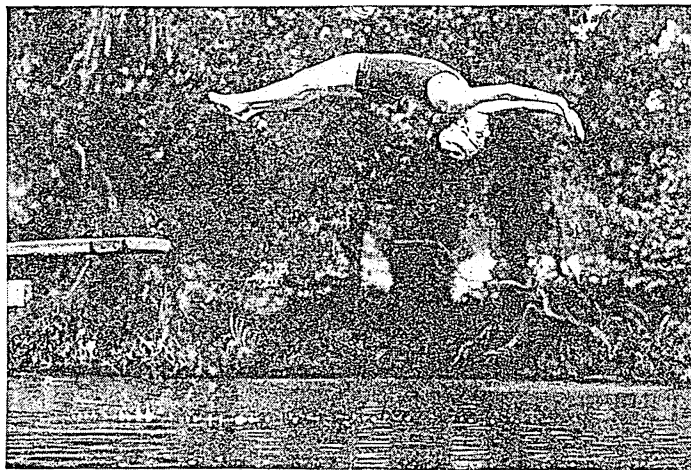
national dues, and so does each Brownie. Information about the program and activities of the various age groups is contained in the Brownie Handbook, the Girl Scout Handbook, the Senior Girl Scout Planning Book, and the Idea Book. All these books may be obtained by writing to Girl Scouts, Inc., 14 West 49th Street, New York City.

THE LITTLE HOUSE AT WASHINGTON, D.C.



The Girl Scout Little House in the nation's capital is modeled after the boyhood home of John Howard Payne at East Hampton, L.I., which inspired his famous song, 'Home Sweet Home'. Girl Scouts use it for meetings and varied activities.

A BEAUTIFUL BACK DIVE



In swimming and other sports, Scouts learn the rules of healthful living. Many girls have won life-saving awards by their courage and skill in the water.

The Girl Scout promise is this:

On my honor, I will try;
To do my duty to God
and my Country;
To help other people at
all times;
To obey the scout laws.

The laws of the Girl Scouts are these:

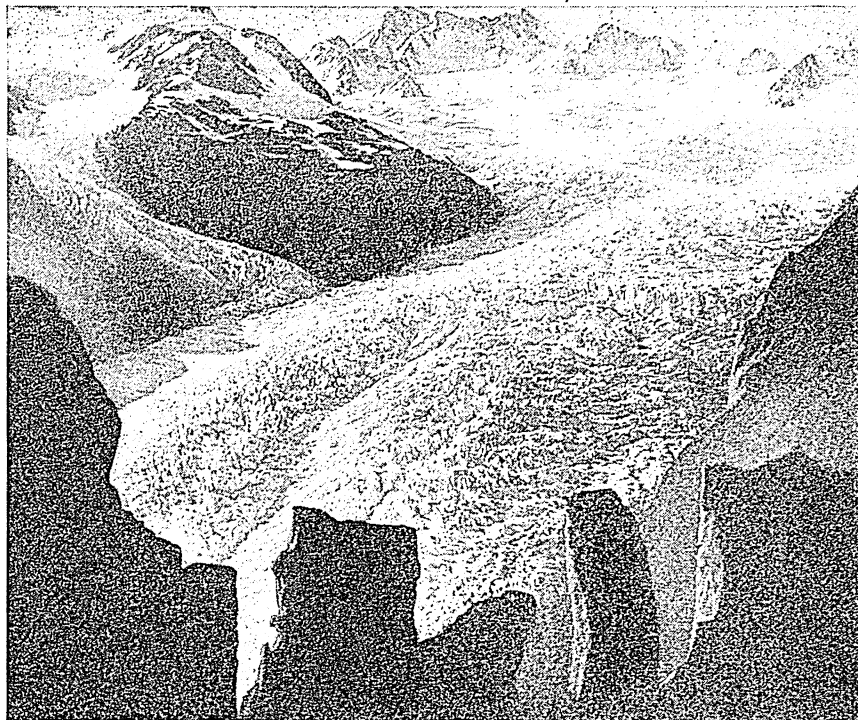
1. A Girl Scout's honor is to be trusted.
2. A Girl Scout is loyal.
3. A Girl Scout's duty is to be useful and to help others.
4. A Girl Scout is a friend to all, and sister to every other Girl Scout.
5. A Girl Scout is courteous.
6. A Girl Scout is a friend to animals.
7. A Girl Scout obeys orders.
8. A Girl Scout is cheerful.
9. A Girl Scout is thrifty.
10. A Girl Scout is clean in thought, word, and deed.

The Girl Scouts' motto is: "Be prepared." Their slogan is: "Do a good turn daily." Their pin is a trefoil with the initials "G. S." and the American eagle in low relief.

GLACIER. Of all the sculptors' tools at work carving and polishing the face of our earth, perhaps the strangest and most awe-inspiring is the glacier, a great river or sea of ice, pouring invisibly down a mountain side, carrying huge boulders, breaking off hillsides, building up walls and mounds of stone more grandly than ever an Egyptian king built up the pyramids. But they work slowly, imperceptibly, over the long years. They look as still and motionless as the rocks they move. How do they work? What starts them on their age-long tasks?

In many of the world's high mountains, the heat of summer is not sufficient to melt all the snow which falls in winter. And wherever this occurs year after year, the amount which accumulates in the upper ends of mountain valleys comes to be very great. These areas where the snow lasts from year to year are known as snow-fields. In the sunny days of summer the surface snow of a snow-field melts, and the water, sinking into the snow, freezes beneath the surface, just as it does in the last snow banks of spring, and helps to change the snow to ice. The weight of the snow above also compacts the snow below. By the melting and refreezing of the water, and by pressure, the larger part of the snow of a snow-field is changed into ice. Just below the snow at the top the

WHERE ICE FLOWS IN A SLOW, WHITE RIVER



Great crevasses and sharp pinnacles of ice cover the surface of the Franz Josef Glacier in the Southern Alps, South Island, New Zealand. Such crevasses are often produced when a glacier rounds a curve, as this one does. In the foreground is Castle Rock.

ice is not very compact, but farther below the surface it is solid. A snow-field is therefore really an ice-field, only covered with snow.

When the snow and ice become sufficiently deep, the ice begins to creep down the slope. Ice which has this slow creeping movement down a mountain valley from a snow-field above is a "valley glacier." There are many valley glaciers in the northwestern part of the United States. There are more in Washington than in any other state, but there are a number in western Montana, where an area has been set aside as Glacier National Park. The park has been provided with stopping places, so that it is now easy for travelers to visit the glaciers. There are a few glaciers in the high mountains of Wyoming and Colorado, California and Oregon. There are many glaciers in the mountains of western Canada, in Alaska, in the Andes Mountains of South America, in the Alps and other high mountains of Europe, as well as in other parts of the world.

There is another great type of glacier, which is not a valley glacier. When the snow and ice accumulate in quantity on a plain or a plateau, it moves out from the center in all directions. This sort of a glacier is an "ice-cap." If it is very large, it is a continental glacier. About four-fifths of all the surface of Greenland is covered with such an ice-cap, and the area of accumulated ice discovered by explorers around the South Pole, in Antarctica, is still larger.

Glaciers move at the rate of a few inches or a few

feet a day. There are perhaps glaciers which move as much as 100 feet a day, but few of them move more than three or four feet. During the movement, the ice is cracked, especially where the ground over which it passes is rough. Thus arise the big cracks or "crevasses" which make travel across glaciers difficult and dangerous.

As the ice moves it gathers up great masses of earth and stones. This debris, carried either on top of the glacier, or frozen within or underneath it, eventually forms belts or ridges known as "moraines" which are sometimes 25 to 100 feet high. A rounded, elongated moraine whose longer axis points in the direction of ice movement is called a "drumlin." The unsorted, jumbled mixture forming the moraines and drumlins is known as "glacial till" or "bowlder clay," while the general term "glacial drift" includes all material which may be deposited by glaciers, regardless of its form or nature.

The huge ice-cap, which formerly covered about 4,000,000 square miles of the northern half of North America, produced great topographical changes by eroding the surface of the land and by depositing drift. This production of surface changes by glacial action is called "glaciation," and a country which exhibits them is said to be "glaciated." (See Ice Age.)

GLACIER NATIONAL PARK. "The Alps—right here in the United States!" This is the first cry of the visitor to that mountain wonderland in northern Montana where 60 living glaciers wind in and out among chains of unscaled crags glistening with ice and snow; a place where waterfalls tumble down dizzy precipices, edged by primeval forests; where 250 lakes lie cradled among giant peaks, and where enchanted streams wander through wildflower gardens.

This public park has been called "the roof of North America," for from its mountain heights the waters divide and flow into the Gulf of Mexico, into Hudson Bay, and into the Pacific Ocean. It was once a favorite haunt of the Blackfoot Indians, but when copper was discovered there in 1890 the white man found his way to this home of the mountain sheep, and in 1896 Congress bought it from the Indians. Fourteen years later, since the copper deposits were not large enough to pay for mining, the region was turned into a national park.

Today the wilderness of about 1,500 square miles is dotted with camps, cabins, and modern hotels. In 1932, Glacier Park and the adjoining Waterton Lakes National Park in Canada were combined to form the Waterton-Glacier International Peace Park.

GLADIATOR. "We who are about to die salute you!" Such was the cry with which the gladiators or professional fighters of the Roman arena saluted the Emperor as they marched about the amphitheater before engaging in combat with one another, or with wild beasts, for the entertainment of the populace. For the most part they were prisoners taken in war, slaves, or the worst classes of criminals. When a gladiator was disabled or disarmed, if the spectators

turned up their thumbs the vanquished man was to be spared, but if they turned them down he was to be slain. The successful fighter was at first rewarded with a palm-branch, but in later years it became the custom to add to this rich and valuable presents and a prize of money.

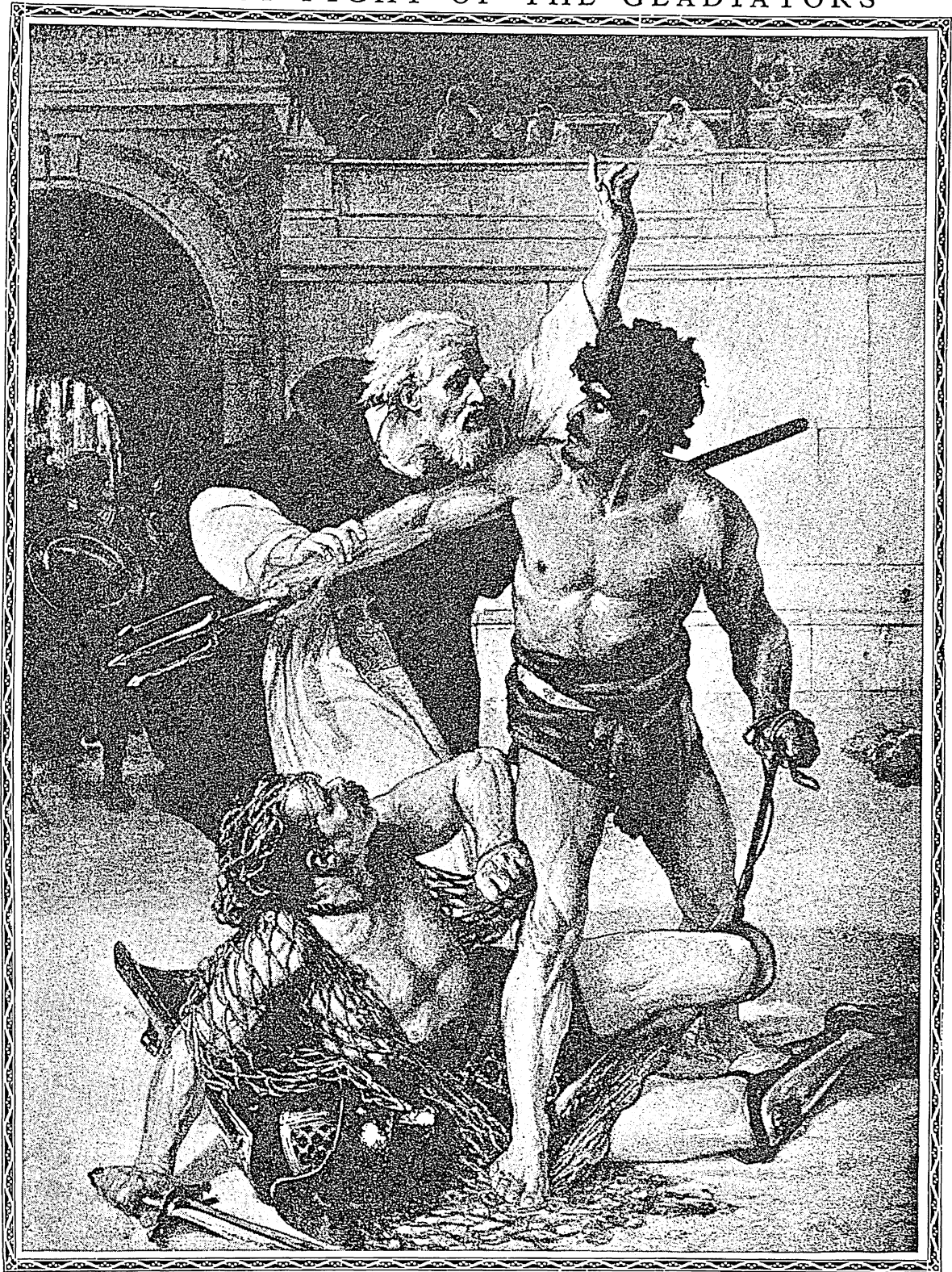
The custom of giving gladiatorial shows seems to have been borrowed from the Etruscans, who sacrificed slaves and prisoners on the tombs of illustrious chieftains. The first combat in Roman history took place in 264 B.C., and the fashion rapidly spread. Julius Caesar gave a show at which 320 couples fought, and the Emperor Titus (79-81 A.D.) gave an exhibition of gladiators, wild beasts, and sea fights which lasted 100 days, in which 10,000 men fought. Such contests were finally stopped in 404 A.D., it is said, as a result of the splendid daring of Telemachus, an Asiatic monk, who rushing into the arena strove to part two gladiators. The spectators stoned him to death, but the Emperor Honorius issued an edict suppressing such exhibitions.

GLADIOLUS. Stately in form and rich in color, the gladiolus is one of the most effective of autumn flowers. Wonderful results have been secured by scientists in creating new varieties, until there are now about 140 species of this lily-like flower, ranging in color from white and pink, through yellow, apricot, orange, and bronze, to deep rich rose and reds. The flowers grow in spikes and the best varieties are of large size, sometimes measuring 7 to 9 inches across. The plants often reach a height of 4 or 5 feet. The gladiolus belongs to the Iris family (*Iridaceae*), and most of the species are natives of South Africa. The name is the diminutive of the Latin *gladius*, a sword, from the shape of the leaves. "Sword lily" is a name frequently applied to it.

GLADSTONE, WILLIAM EWART (1809-1898). For 60 years William E. Gladstone was a member of the British Parliament. For more than half that time he was the acknowledged leader of the Liberal party. Four times he was called upon to guide the affairs of the British Empire as prime minister, and his name became associated with a great number of political and social reforms. Such a record has been equaled by few men in history, and few have exerted through the force of their characters and personality so profound an influence upon their times as this son of a Scotch merchant.

Gladstone's father conducted a large and thriving mercantile business in Liverpool, and also owned extensive coffee and sugar plantations in the West Indies. Curiously enough, it was the wealth produced on these plantations by slave labor (before the Emancipation Act of 1833) that enabled his son to devote his life to the cause of human liberty. When William was 11 years old he was sent to the famous boys' school of Eton, and from Eton he went to Oxford University, where he was graduated in 1831 with first honors in mathematics and in the Greek and Latin classics. Only once in a generation does a student

THE LAST FIGHT OF THE GLADIATORS



It was in the year 404 A.D. during the reign of the Emperor Honorius that this thrilling event took place. The gladiator with the trident and the net had just brought down his heavy-armed antagonist and was about to deliver the death blow. The crowd in the Colosseum watched breathlessly for the fatal thrust. Suddenly the aged monk Telemachus leaped into the arena, and in the name of God called upon the victor to stop. Telemachus was stoned to death by the infuriated crowd, but his brave sacrifice had its reward, for the emperor forbade gladiatorial combats from that day on.

win the distinction of a "double first" in these subjects. Deference to his father's wishes led him to give up his own inclination to become a Church of England clergyman, and to enter political life. To the end of his days he retained his interest in theology and in the classics, and in the midst of a busy political career one of his chief diversions was reading Homer in Greek and writing on Homeric subjects and on religion.

Gladstone entered the House of Commons in 1833, at the age of 24. Less than ten years later he became president of the Board of Trade and so a member of the ministry. In the beginning he was so little of a Liberal that Macaulay styled him "the rising hope of the stern unbending Tories." He first abandoned the Tories or Conservatives in 1846, when he supported the Conservative leader Sir Robert Peel against the mass of the Conservatives in repealing the "Corn Laws," so that the people in Ireland might be saved from starving. It was not until 13 years later that he definitely joined the Whig or Liberal party, of which a few years later he became leader.

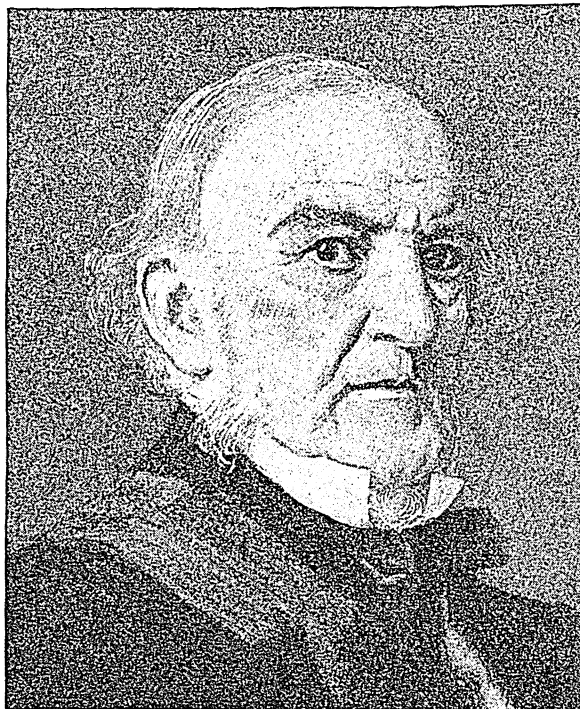
One of the spectacular feats which first brought Gladstone fame was the defeat he administered in 1852 to Benjamin Disraeli, then chancellor of the exchequer, in a fast and furious debate over the budget. With an eloquence and mastery of details which were almost unprecedented, he tore Disraeli's financial scheme to ribbons. The rivalry between Gladstone and Disraeli, who presently became the official leader of the Conservative party, lasted until Disraeli's death in 1881. (See Disraeli, Benjamin.)

In the course of the American Civil War, when so many of the upper classes in Great Britain sympathized with the South, Gladstone became very unpopular with the people of the Northern States because of a public address in 1862 in which he said: "We may have our own opinions about slavery; we may be for or against the South; but there is no doubt that Jefferson Davis and other leaders of the South have made an army; they are making, it appears, a navy; and they have made what is more than either, they have made a nation." This was taken to indicate that the British government, of which he was a prominent member, intended to recognize the inde-

pendence of the Southern States. Years later Gladstone acknowledged that he had committed an inexcusable blunder in uttering those words. In his first period as prime minister (1868-74), he did much to heal the breach between the United States and Great Britain by agreeing (in 1870) to submit to arbitration the claims of the United States for damages growing out of the *Alabama* affair (see 'Alabama' Claims).

It was in his first premiership also that Gladstone began to pass his great measures of internal reform. He secured the passage of a law which for the first time gave state aid to public elementary schools. He opened the universities of Oxford and Cambridge to men of all religions. He introduced secret voting by ballot at the elections, in place of the old public method of voting.

But more than anything else, Gladstone's name is connected with his measures for Ireland. Although most of the people of that island were Catholics, the Anglican or Protestant Episcopal Church was the established church of Ireland, supported by



WILLIAM EWART GLADSTONE
The "Grand Old Man" of British Politics

tithes, until Gladstone passed the Irish Disestablishment Act of 1869. He also passed the first Irish Land Act (1870), which removed some of the most serious economic burdens from which the Irish peasants were suffering, and started the process by which most of the Irish tillers of the soil have been changed from rent-paying tenants to owners of the lands. Finally when Gladstone became convinced that the majority of the Irish wanted the Irish parliament restored, he introduced the first Irish Home Rule Bill. This bill (1886) was defeated in the House of Commons by the desertion of a large group of his followers who thenceforth were called Liberal Unionists; and Gladstone was forced to retire as prime minister. When a change in the elections again brought him to that position, he introduced his second Home Rule Bill (1893); this passed the House of Commons but was rejected by the House of Lords. It was then for the first time that the cry was raised to "mend or end" the House of Lords.

Gladstone's political work was now practically closed. In a short time the "Grand Old Man," now in his 85th year, retired from public life on account of

approaching blindness due to cataract. His remaining years were spent at his home at Hawarden Castle in Wales. Several times he had been offered a peerage by the Queen, but refused, preferring to remain a commoner. In his long political career he had developed from a Tory to a moderate Conservative, then into a Liberal, and ended as the acknowledged leader of the Radicals. He himself once explained the changes in his political opinions in these words: "I was brought up to distrust and dislike liberty; I learned to believe in it. That is the key to all my changes."

Gladstone was most imposing in his appearance. Six feet tall, with a great breadth of shoulders, and a large head, jet-black hair (in his younger days), deep-set flashing eyes, a prominent nose, and a face of extreme pallor, he seemed to bear down from above upon his opponents. Gladstone used to say that the true secret of his success lay in his faculty of concentrating his mind upon the subject of the moment. This quality he carried even into his life at home. Often even when guests were present he would draw a pocket edition of some classic from his pocket and retire behind the book, becoming utterly unconscious of what was going on around him. Mrs. Gladstone, who had been Miss Catherine Glynne before her marriage in 1830, at times found this habit somewhat embarrassing. Yet during their long married life (Mrs. Gladstone survived her husband by two years) the atmosphere at Hawarden was ideal. One of Gladstone's habits was to sing with his wife when any adversity overtook them:

A ragamuffin husband and a rantipoling wife,

We'll fiddle it and scrape it through the ups and downs of life.

Visitors used to come from all parts of Great Britain to watch the Grand Old Man taking exercise by chopping trees on his estate.

Gladstone served as prime minister from 1868 to 1874; from 1880 to 1885; from February to July, 1886; and from 1892 to 1894. Aside from his fame as a statesman and an orator, he received recognition from his books: 'Studies on Homer' (1858); 'Juventus Mundi' (1869); 'The Irish Question' (1886); 'Gleanings from Past Years' (8 volumes, 1879-90).

GLAND. Every day the human body produces several quarts of liquid. Whenever you cry a liquid called tears flows out between the eyelids and whenever you wink a tear is distributed over the front of each eye. When you are warm a liquid called sweat comes out on the skin. Where do these liquids come from?

The answer is that they are manufactured by organs of the body called "glands." Each gland takes water and other substances out of the blood and from these manufactures its own kind of liquid, which is called a secretion. Tears are secreted by the lachrymal glands. Saliva is the secretion of the salivary glands. A tube called a duct leads from each salivary gland into the mouth. The "mammary gland" secretes milk. In the wall of the stomach are "gastric glands" which discharge "gastric juices" through short ducts into the stomach. The liver sends its secretion or "bile"

through the "bile duct" into the intestine. Another large gland called the pancreas or sweetbread makes a liquid known as "pancreatic juice," which is conveyed into the intestine by a duct. The saliva, gastric juice, bile, and pancreatic juice are all secretions which are useful in the digestion of food.

All the glands mentioned so far have ducts by which their secretion is carried either to the outside of the body or into the alimentary canal. But there are also certain "ductless" or "endocrine" glands. The secretions which they produce find their way into the blood and are carried all over the body, where they influence the activity of organs distant from the glands themselves. "Hormones," from the Greek word *hormao*, meaning to excite, is the name given to these internal secretions which act like little chemical messengers in our bodies.

Many gland products are used up in doing their work. Bile enters into a chemical reaction with fat, while mucin is a mechanical lubricant. But enzymes and hormones are not lost or changed in exercising control. Enzymes, moreover, are specific; a certain kind acts only on a certain substance or group of similar substances. (See Enzymes.)

Importance of Thyroid Gland

The thyroid gland located in the neck secretes the hormone thyroxin, an iodine-containing substance known to have a wonderful influence on the utilization of food by the body. If a baby has too little thyroxin, it does not grow properly but becomes a peculiar idiotic dwarf known as a "cretin." In adults the lack of thyroid secretion leads to "myxedema," a disease characterized by mental and physical sluggishness. Most forms of goiter are caused by too little thyroxin in the body. The thyroid glands of animals and the hormone thyroxin are used in treatment of cretinism, myxedema, and goiter. Thyroxin stimulates the muscular and mental activity, glandular action, and heart-beat, and so "peps up" the entire system. It should be taken only by a doctor's orders.

The suprarenal glands are two small structures each fitting snugly on top of a kidney. They produce a hormone called "epinephrin" or "adrenalin" which is continuously being given off in very small amounts into the blood. During stress of certain emotions, such as fear or anger, the glands pour much larger amounts of this hormone into the blood. It is adrenalin which helps the football player to carry the ball across the goal for a touchdown, and makes it possible for a man to rescue the piano from his burning house. When these glands become overactive during adult life, some of the characteristics of the opposite sex appear; a woman's voice, for instance, acquires the deep tones of a man's and hair grows on her face. Such a type is the bearded lady of the circus.

Gland that Makes Dwarfs or Giants

The pituitary gland, which is made up of several lobes or parts, lies in a groove at the base of the brain. These lobes form hormones which play different rôles in the animal organism. Too little secretion from

one of the lobes causes a child to become a tiny dwarf or a miniature man. Too much of this secretion is as bad as too little, for it causes the baby to grow into a symmetrical giant. Rats fed on the hormone which is taken from the anterior lobe become monstrous giants in the rat kingdom.

The parathyroid glands are four tiny bodies looking very much like wheat grains found alongside the thyroid. An extract prepared from these glands has a profound influence on lime metabolism and controls the calcium, or lime, of the body. The hormones produced by these glands influence the growth of bones in our bodies. Removal of the parathyroid glands results in tetany, a condition characterized by convulsions, fits, loss of weight, and almost always, death. Tetany was prevented or relieved in dogs from which the parathyroid glands had been completely removed by injecting extracts of the parathyroid glands.

In general, the ductless glands are essential to the body. Removal of the pituitary, suprarenals, or parathyroids causes death in a few days.

In 1921 Dr. F. G. Banting and associated workers achieved a triumph in gland therapy by finding how to isolate insulin. Insulin is a hormone secreted by the "isles of Langerhans," or patches of secreting cells, in the pancreas; it regulates the supply and use of sugar in the blood. Lack of it causes a fatal disease, *diabetes mellitus*. This disease can now be controlled by daily doses of insulin, obtained from the pancreas of animals in meat-packing plants.

GLASGOW, SCOTLAND. Smoke from the giant chimneys of scores of factories; a deafening clatter from thousands of hammers pounding on cold steel; miles of shipyards lining each side of the river with forests of masts, acres of hulls, and skeletons of many vessels; and, winding in and out among nine miles of quays and docks, steamers old and new flying the flags of

village, but the people determined to have a port. They began to deepen, widen, and wall in their River Clyde which was then only three feet deep. That was in 1772. The city today ranks as a great world port, with a fine artificial harbor. Next to London, it is the largest city of Great Britain.

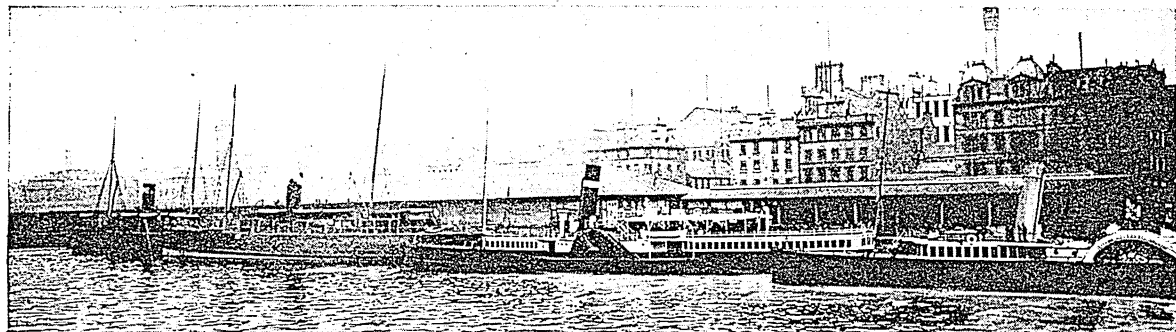
With its excellent connections by road, rail, and water, and its location in the midst of iron and coal fields, Glasgow naturally became a great iron and steel center, making locomotives, sewing machines, and other machinery, as well as ships. Abundant supplies of pure water were a factor in developing textile industries, especially the manufacture of thread and fancy cotton fabrics, and bleaching, printing, and dyeing. The manufacture of chemicals is also important.

Glasgow is the starting point for tourists who visit the western Highlands. Here is some of the finest scenery of the British Isles, including Ben Nevis, Ben Lomond, the Trossachs, Loch Lomond, and Loch Katrine, the scene of Scott's 'Lady of the Lake'.

The old part of Glasgow slopes down to the river—here called the Broomielaw—and the new part is on the higher background. Glasgow is known as one of the world's best governed municipalities. The various city improvements and undertakings are carried out by a corporation which divides itself up into a series of "trusts" with subcommittees that supervise the different departments of city administration. There are Market Trusts, Police Trusts, Improvement Trusts, etc. Glasgow's system of municipal ownership of public utilities has proved to be very efficient and economical.

Although rather dingy and smoky in appearance, Glasgow has many splendid buildings, most of them of recent erection. Its cathedral (St. Mungo's) built between 1197 and 1446, is a beautiful example of

THE PARTNERSHIP OF GLASGOW AND THE CLYDE



It has been said that "Glasgow made the Clyde and the Clyde made Glasgow," and this is largely true. The city made the river into a great harbor, and the harbor is the key to Glasgow's present greatness. This view shows a section of the busy river-front.

every nation! This is Glasgow, Scotland's industrial and maritime metropolis, which is not only one of the greatest manufacturing cities but also the shipbuilding center of the world.

"Glasgow made the Clyde and the Clyde made Glasgow" is one of the true sayings of this city. Many years ago Glasgow was only a small marshy

early English architecture. The massive modern buildings of the University of Glasgow (founded 1451) occupy a commanding position in the handsomest part of the city. The world-famous municipal art gallery contains the finest collection of paintings in Great Britain outside of London, including Whistler's portrait of Carlyle. Population, about 1,090,000.

The MAGIC ART of the GLASSMAKER

A Striking Example of the Chemist's Achievements and of the Mysterious Transformations Wrought by Fire—The Work of the Blower with His Big Glass Bubble

GLASS. No one knows where or when men first made glass. A story told by Pliny the Elder, a Roman writer, suggests how the discovery may have been made, but modern research has traced glass far before the date Pliny set. According to him, Phoenician sailors bound for Syria from Egypt were driven off their course and landed in Palestine. They had no stones for a fireplace, so they used blocks of natron, a crude form of soda which was part of their cargo. In the ashes next morning they found shapeless lumps of glass, formed by the fusion of beach sand and the crude soda.

We know now that the Phoenicians were not the first to make glass, because bits of glass have been found in Egypt supposed to date from before the First Dynasty (3400 B.C.). The oldest definitely dated piece, in an Oxford museum, is a large ball-bead bearing the cartouche of Amenhotep, who reigned from 1551 to 1527 B.C. Glass beads found in excavations of the Third Dynasty of Ur (2450 B.C.) indicate that the manufacture may have started in Mesopotamia, or even farther north.

Most glass today is made from the same materials used from the very beginning, namely, soda, lime, and sand; and the proportions are usually about the same as those used perhaps 4,000 years ago or more. In forest countries, potash may replace soda as the alkali; and potash is used elsewhere for finer, harder glass. In a modern factory, carefully measured proportions of these ingredients and waste glass, called *cullet*, are

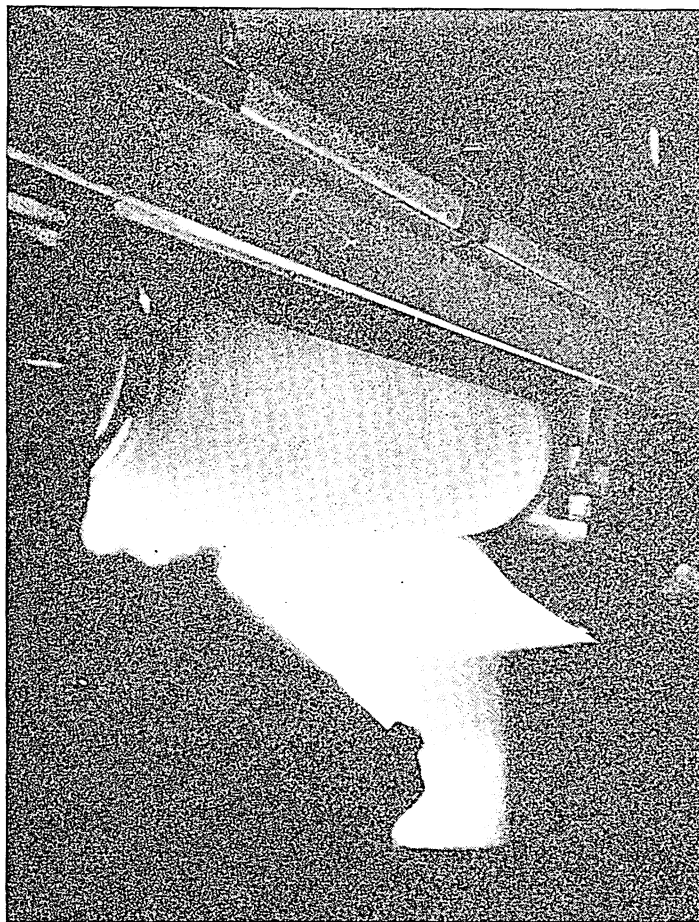
melted in large tanks built of fire-clay slabs, or in special fire-clay crucibles for the finer grades. The waste glass is used not only for the sake of economy, but also because it aids in the melting. From 20 to 80 per cent of the mixture may be cullet. If pots are used, from 3 to 18 are put into one furnace. The tanks

may be as large as 30 feet wide, 140 feet long, and 5 feet deep, holding 1,800 tons of glass; but smaller tanks are more general. The furnace walls are of almost pure silica, for even fire-clay cannot stand the terrific heat needed to produce glass, which runs to 2600° F. or even higher. When the mixture is as liquid as water, impurities are removed and it is allowed to cool until it is "sticky," and ready for blowing or molding.

For ages glass was drawn by hand and blown by mouth. Now most flat glass and bottles are made in machines. In the Libbey-Owens system, molten glass passes from furnace to a refining chamber, in which it is gradually settled or refined. Next an iron "bait," about three inches wide and six feet long, is backed into the molten glass on ma-

chinery. Plastic glass sticking to the bait is drawn or pulled up two or three feet, moved out, and sent over a bending roll in the form of a wide, flat sheet. The thickness depends on the temperature of the glass and the speed with which it is drawn from the chamber. A sheet drawn at 40 to 60 inches a minute makes a window glass thickness; at 23 inches a minute, glass one-fourth inch thick results.

MAKING PLATE GLASS BY THE MILE



A torrent of molten glass pours from a refining chamber to pass between these two great rolls and emerge on the casting table as a flat continuous sheet. The speed of these rolls determines the thickness of the glass at any given temperature, and the faster the rolls move the thinner is the sheet of glass that is drawn from the refining chamber to the table. From there, the sheet goes through a long annealing tunnel in which it is slowly cooled. Then it is cut, ground, and polished.

From the bending roll the glass passes through an annealing oven, called a *lehr* or *leer*. This is a tunnel 200 feet or more long, in which the glass is heated to just below the melting point, then cooled by degrees, thus hardening it. After leaving the *lehr*, it is cleaned in dilute acid and cut into large sheets.

In the Fourcault continuous process, a slotted block of some refractory material is lowered into the drawing tank, and the glass flows up through the slot. Two water-cooled tubes near the sides of the slot cool the glass and give it the resistance needed for the upward pull that follows. The glass is drawn up through pairs of asbestos-covered rollers, set in a shaft about 15 feet high. Each pair of rollers is in a separate compartment, and the heat of each compartment is lower as the glass ascends. This anneals the glass by the time it reaches the top of the shaft. Here the bait is broken from the glass, but the rollers force the glass up through a slit in a wooden platform until it is the height desired, when the plate is cut off.

Machine-Made Sheet Glass

Machine-blown cylinder glass is made by pouring molten glass into a series of pots, from which it is drawn by a pipe or tube. Compressed air is blown through the hollow globe of glass, which adheres both to the tube, as it is raised, and to the glass still in the pot. The globe stretches to a long cylinder as the tube rises and more and more air is forced in. When the cylinder is perhaps 50 feet long and 30 inches in diameter, it is broken from tube and pot and lowered by machine to a cradle. Here it is cut into sections, which are split lengthwise by red hot wires; next it goes to flattening ovens, where heat softens the glass, and it is ironed flat by wooden hoes or rollers. Then it goes through the annealing *lehr*, is cleaned with dilute acid, and cut.

Plate glass is melted in pots for the "discontinuous" process, or in tanks for the "continuous" process. Sixteen or 20 pots are set on the two sides of a rectangular regenerative furnace, each pot holding about 2,000 pounds of glass, enough to cast one table plate. Cranes carry the pots to iron tables 12 to 14 feet wide and 20 to 28 feet long, and dump them. Adjustable strips or rims at each side of the table regulate the thickness of the glass. Cast iron rollers, about 18 inches in diameter, iron the glass on the tables into sheets; next it goes through a *lehr* perhaps 400 feet long, in which rollers slide the glass along.

The rough glass that comes out of the *lehr* is the coarser or "skylight" grade. For finer grades, used for shop windows, mirrors, and similar purposes, defective glass is cut out and the perfect sheets are ground and polished. The glass is laid in plates on a circular table, the largest pieces in the center, and fastened with plaster of paris. Workmen walk or jump on each plate till it is solidly attached to the table; cullet is poured into the spaces between plates and the notches in the rim of the table, and filled in with plaster, to keep the glass pieces from clashing. The table then goes to the grinding machine. This is a

large circular frame in which the table rotates at great speed, while two grinding rubbers—large circular disks shod with many small iron blocks—revolve also and sweep over the rotating glass. The grinding is done with sand and water, fed through the machine automatically. First coarse sand is used, then finer and finer; and the grinding is finished with emery.

The glass is polished on a machine similar to the grinder, except that the disks are padded heavily with felt, and they rub in oxide of iron and water, called "rouge," instead of sand, to smooth all scratches and impart the desired luster. Often 30 or more different abrasives are used in grinding and polishing glass.

In the so-called "continuous" process of making plate glass, the tank consists of three chambers: the "dog-house," from which the raw materials are delivered to the melting chamber; the melting chamber; and the refining chamber. Melted glass flows from the refining chamber through a spout to a moving table and under a roller, whence it emerges as a flat continuous sheet of the required width and thickness. Next it goes through a long *lehr*, then it is cut into plates and is ready for grinding and polishing.

Transparent Coloring for Glass

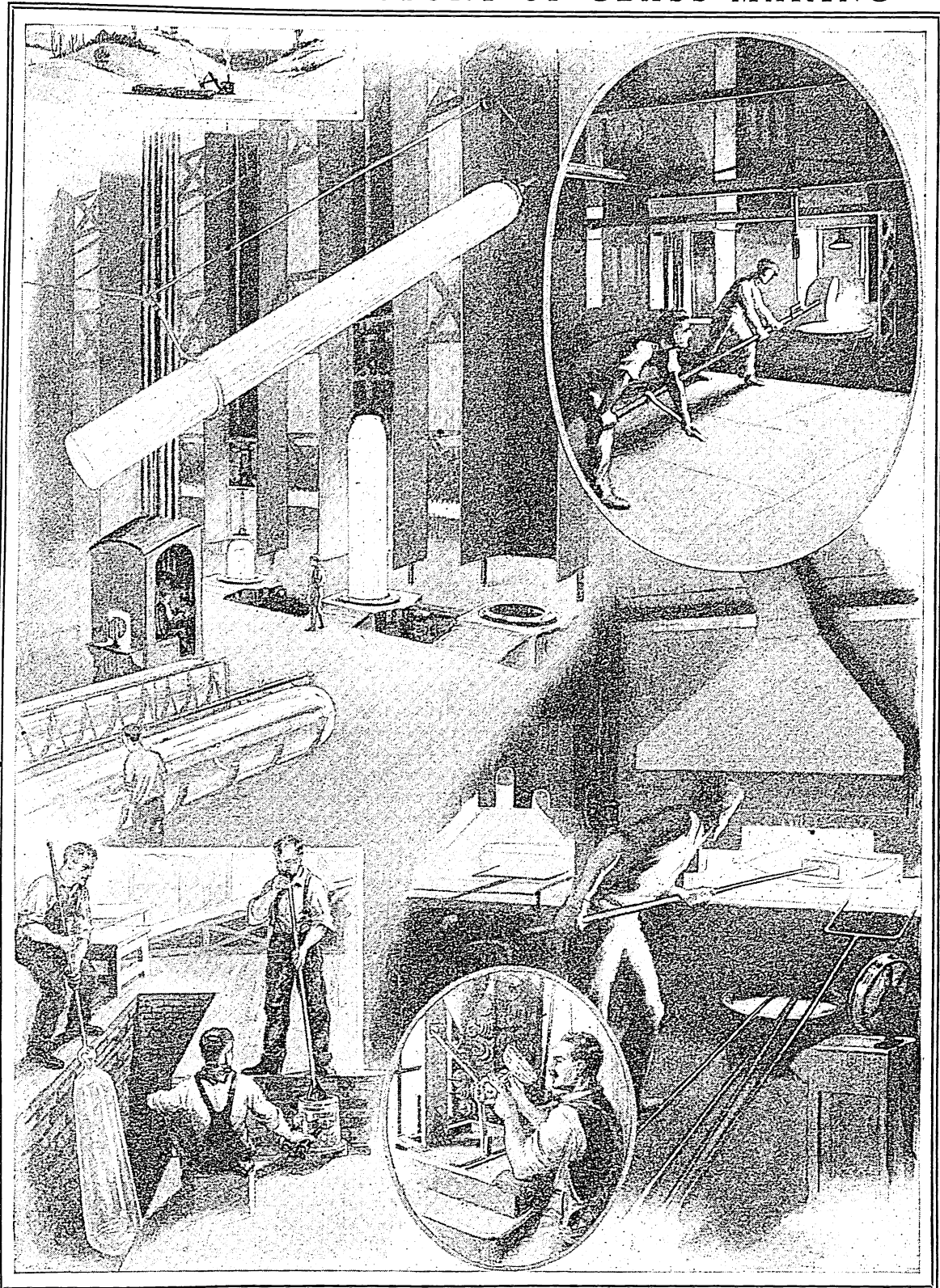
Glass is colored by adding small amounts of various metallic oxides to the usual materials. Experts say the fine colored glass now molded in America equals the best products of European factories. Reds, pinks, and oranges are secured from copper, iron oxide, manganese, selenium, or gold. Uranium, silver, or antimony provides yellows; iron, copper, manganese, or chromium gives greens. Blues come from cobalt and copper; blacks from manganese and cobalt or finely powdered coal; and violets from nickel or manganese. Arsenic and manganese are used to make glass colorless. Only a tiny portion of gold is used to make the finest ruby glasses; the expense is cut by adding a thin coat of ruby glass to a sheet of clear glass. The finest tinted glass, a rich ruby, is sometimes made by melting a \$20 gold piece in acid as the coloring agent; one coin will color a 300-pound batch.

American railroads and highways use selenium ruby (see Selenium) exclusively for red danger signals. Once there were 32 shades of green and almost as many of red in railroad signal lamps; the confusion and danger of mistaking reddish-yellows for blue-yellows resulted in a standardizing of these colors, and made possible the use of yellow, as a "caution" signal.

American genius also has developed glasses which transmit ultra-violet rays and absorb the visible light; other glasses which absorb the ultra-violet but transmit visible light; and glasses for welders which absorb both ultra-violet and infra-red rays, and also such excess of visible light as causes glare.

Even plain clear glass varies greatly in composition, depending on the "base" mixed with the silicate, and on the treatment. Lead and barium add weight and brilliancy and increase the softness during manufacture. Manganese and aluminum give a glass that stands red heat without softening. "Crown" glass,

SCENES IN THE STORY OF GLASS-MAKING



The melted glass is ladled into iron pots (upper right). Then hollow blowpipes are dipped into it and gradually raised by machinery, drawing with them great cylinders of glass 40 or 50 feet long. These cylinders are lowered into cradle-like rests and cut up by hot rods. The sections are again heated in open ovens (lower right) and ironed into flat sheets. The men in the lower left-hand picture are blowing glass by the old mouth-blowing method, and the man in the oval is cutting table glass on an emery wheel.

a hand-blown product now seldom made, contains soda and has an extra brilliant surface. "Flint glass," also called "crystal glass," contains lead; it got its name because the silica was obtained from powdered flints; the term is applied now to almost any transparent colorless glass.

Exactness in cooling is essential. Glass is an extremely poor conductor of heat; boiling water poured into a tumbler will crack it, because the inside gets hot and expands quickly, while the outside remains cold and contracted. Some fine grades are cooled for weeks or months to produce the proper temper.

Glass that withstands sudden changes in temperature can be made from fused quartz, but at considerable expense. Quartz melts only at 3,200° F., much higher than the melting point of glass. Even then it is thick and viscous, and must be crushed and subjected to great pressure to drive out bubbles. Windows and even walls of sanatoriums may be made of such glass because it admits one-third or more of the ultra-violet rays of the sun, which are so helpful in the treatment of certain diseases. Quartz condenser lenses in motion-picture machines last far longer than ordinary glass lenses; and fused quartz reflectors and lenses are used in some astronomical instruments because they do not change size or shape, as glass does.

A more general use for heat-resisting glass is found in cooking vessels, laboratory utensils, water-gauges for steam boilers, etc. The material used in this glass is called "borosilicate," meaning borax plus silica, the silica being quartz. Boric acid added to quartz sand acts as a flux, and greatly lowers the melting point, cheapening the cost, but still produces a glass with many properties of fused quartz glass, though tougher and less brittle. Although glass is a poor heat conductor, glass dishes are used for baking because glass does not reflect heat, as do metal dishes, so the baking is as fast or faster, but cooling is slower. Glass containing borax resists scratching and breaking better than ordinary glass.

Safety, Laminated, and Shatter-Proof Glass

Various safety glasses, called "shatter-proof" or "laminated," are used for the windows of automobiles, airplanes, and ships. To make them, a thin sheet of plastic material is cemented between two sheets of glass. The first plastics used for this purpose were pyroxylin and cellulose acetate. These have now been largely replaced by vinyl resins (*see* Plastics). The cement for the glass-and-plastic "sandwich" is dehydrated gelatin. Each sheet of glass is

only one-eighth of an inch thick so the completed plate is little heavier than ordinary glass. This "sandwich" glass, when broken, adheres to the plastic instead of flying about. "Bullet-proof" glass is a sandwich of thick glass and transparent strips of pyroxylin, usually with two layers of each.

"Tempered," or "flexible," glass is made by heating sheets to about 1,500 degrees Fahrenheit, then chilling them with a blast of cold air. The outer surfaces contract, putting the inside under tension. The glass then is exceedingly strong, and flexible enough to bend about 20°. When broken it crumbles into small bits without sharp edges.

"Wire glass," to resist fire, is made by pressing a heated wire screen into glass before it cools. The glass and wire must cool at approximately the same rate, or the wire would crack the glass as they contract. Borax glass used in bathroom windows, office partitions, etc., is produced by roughening one surface.

"Structural" glass, for sidewalk and roof lights, is made in blocks.

"Cut" and "Frosted" Glass

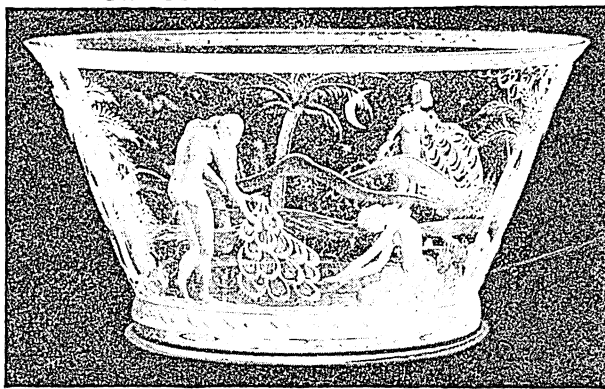
Cut-glass ware is molded into shape and the patterns desired are cut by emery wheels. For the cheaper grades the pattern is stamped into the glass in the molds. Glass is etched by allowing hydrofluoric acid to eat into it through patterns scratched in a thin covering of wax. Electric light bulbs are "frosted" on the inside by spraying the interior

surface with a solution containing hydrofluoric acid.

Amazing machines have been invented to turn out the millions of glass objects we use every day, such as bottles, tumblers, and light bulbs. One machine can make as many as 240 small bottles a minute. A machine that makes five-gallon bottles stands 32 feet high and weighs about 210,000 pounds. Electric light bulbs also are made at wonderful speed by intricate machines (*see* Electric Light and Power). The molds of some machines making lamp chimneys leave one end of the chimney closed; this end is shaped to make a tumbler when it is cut off from the chimney, and properly finished.

High-grade optical glass requires the utmost care in its making. Certain chemicals, principally compounds of barium, boron, magnesium, and phosphorus, when added to the ordinary ingredients, make a decided change in the effect of the glass on light rays that pass through it. Scientists for generations were handicapped by optical defects in the ordinary flint or crown glass of lenses in microscopes, telescopes, photographic apparatus, etc. About 1880 Ernst Abbé and Otto

GLASS CARVED LIKE A GEM



World fame has come to the Swedish glasscutters at Orrefors, who have revived the exquisite art of intaglio engraving on glass. The well-known artist, Edward Hald, made the above fine specimen. It is engraved inside, which makes the figures appear as if in relief.

Schott began experiments at Jena which produced 2,000 new kinds of glass. Of these, more than 70 are valuable in lens making. The rest are prized for colors, heat resistance, toughness, etc. When Jena optical glass was cut off during the World War, other countries made great strides in producing it for telescopes, field glasses, periscopes, and like instruments. A record-breaking American feat was casting the 200-inch reflector for Mount Wilson Observatory in 1934. The casting weighed about 20 tons, and was allowed to cool only a degree or two a day for ten months. Some of the mold's core pieces came to the surface of the molten glass during pouring and were removed; so to avoid possible imperfection, a second disk was poured later. This feat eclipsed the achievement of the French who had made the 100-inch reflector for Mount Wilson.

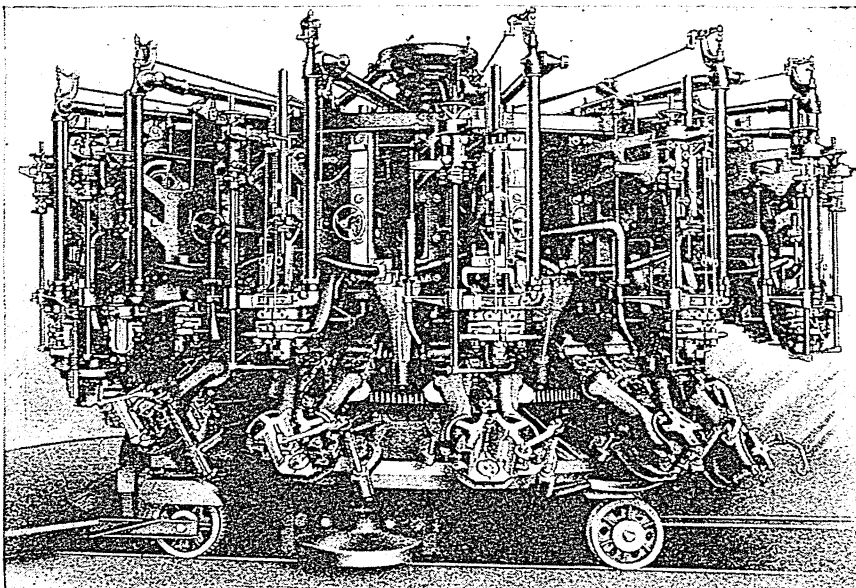
The first steps in making glass for most camera lenses are like those used for ordinary glass, but the heating is carried to about 2,750° F., needed to melt the chemicals added to the usual formula. Also, because optical glass must be almost entirely free from bubbles, special stirring is required to eliminate them. The pot in which the glass is melted cools for a week, during which the glass contracts and breaks into irregular pieces, like ice blocks. Only the best pieces are selected to be reduced to the plates from which the optician makes his lenses and prisms. These choice pieces are remolded in separate re-heating furnaces; when the mass has assumed the shape of the mold, it goes through the final annealing process, a slow cooling that lasts for weeks, or if the pieces be large, for months. Even with all this care, only about 15 per cent of optical glass survives from the original batch of materials. The rest is used for ordinary glassware.

Spun Glass in Art and Industry

Glass can be drawn into exceedingly fine, flexible threads. "Spun glass," a Venetian invention, is usually made by melting the end of a glass rod, drawing a thread from it as one would draw taffy, and fastening the thread to the rim of a wheel. The rod is held in a flame to keep the glass soft while the wheel is revolved rapidly, drawing out the fine thread and winding it up at the same time. The Venetians obtained beautiful designs by entwining many threads of glass, sometimes of varying colors, into bundles, and twisting the bundles into many shapes. Spun glass

can even be woven into cloth, and it makes the bright golden hair of the best china dolls. From this same spun glass is made *glass wool*, sold either in hanks, like yarn, or made into insulating material for batteries by shaping masses of the wool into plates and

IT CAN MAKE A MILLION BOTTLES A WEEK!



This automatic bottle-blowing machine is equipped with 15 arms, which revolve around a vertical axle. Each arm, carrying a mold, passes over a pot of glass and takes up enough to form one bottle, which is blown to the shape of the mold by compressed air. Two of the open molds can be seen at the lower part of the machine. A complete bottle is made at each turn of each arm.

dipping in glue. Glass wool is used also in ink erasers, in filters, and as insulation for mechanical refrigerators.

Stained Glass Cathedral Windows

Stained glass windows were among the chief glories of the Gothic cathedrals with which the Middle Ages enriched Europe. We find the first mention of stained glass windows in the writings of 4th and 5th century Latin and Greek writers. By the 12th century, pictorial designs had been introduced. In the earlier days the glass was dyed throughout by placing it in a melting pot and adding metallic oxides—copper for green, cobalt for blue, and manganese for purple. In this way, that translucent, jewel-like quality was imparted—that "dim, religious light" of the old-world cathedrals. Later, an enamel similarly prepared, was applied to the surface of the glass, and fused on. Various appliquéés could be made, producing various color effects which, by etching could be toned down to the most delicate hues. The bits of the mosaic were fitted into strips of lead folded over the edges. These strips served not only as a binding, but as an outline for the design. Medallions for the larger windows demanded by Gothic architecture were fitted into an iron framework which also enhanced the design.

Cameo or Sculptured Glass

Cameo glass might be called sculptured glass. Layers of glass are fixed to the object to be decorated, and the figures cut into this outside covering, leaving the

decorations standing out from the surface of the original glass, which may be of another color. The Portland vase is the most famous example of this work; on it a scene is cut out of a layer of white opaque glass, standing out from a blue background. It was found near Rome in 1550 in a tomb of the third century A.D., but is thought to date several hundred years earlier than that. It is now kept in the British Museum.

Until the recent development of machines to make glass, all the work was done by hand, and the skilled workers constituted almost a secret order. The great Venetian glass making of the 13th century centered on the island of Murano, and the workers were forbidden to carry their secrets to foreign lands, under penalty even of death. Some did escape to practise their art elsewhere, notably in England, but even these guarded their most cherished processes. The picturesque trade of glass blowing is not entirely dead, however; hand-blown methods still are used for fine hollow-ware and for artistic pieces too delicate or too involved for machines. An interesting type of hand work is the making of models of plants, sea life, and similar objects that cannot easily be preserved for museums.

Hand-blown glass is fashioned today much as it was ages ago. A "gatherer" dips the bell-shaped end of a five-foot blowpipe into the "soup," as he calls the molten glass, and a small ball of glass sticks to it. He blows through the other end of the pipe, forming a thick-skinned bubble. This he dips into the melted glass again and again, blowing the bubble bigger and bigger each time, until it has grown as big and heavy as a watermelon, weighing 20 or even 40 pounds.

Now the pipe and bubble pass to the real expert, the "blower." He puts the bubble in a molding block or "marver," and alternately blows and turns until it becomes long and pear-shaped. The bubble is reheated in a blow furnace as it becomes too cold to expand readily. Next the blower mounts a bridge spanning a deep "swing hole," a pit two by eight feet and six to eight feet deep. He swings the pipe with its mass of glass back and forth, blowing all the while, until it is drawn out into a long cylinder with thin, even sides. When this has cooled, the neck is cut off by wrapping a hot glass thread around it and touching this with a cold iron. Immediately a crack runs around the cylinder in the path of the thread. The open cylinder is laid in a cradle, split lengthwise, heated, and flattened. Hand-blown glass vessels are made by

blowing the glass inside of a mold, thus forcing it out against the walls until it assumes their exact shape.

Glass making was introduced into America about 1608 at Jamestown, Va. Workmen were brought from Europe, and bottles only were made. In 1621, Italians were brought over to make glass beads for trade with the Indians. After 1645 so many glassmakers settled in New Amsterdam that the street now known as

Williams Street was called Glassmakers Street (see American Colonies). Difficulties with temperamental workmen, most of them foreigners, handicapped the trade in America until the introduction of machinery; in fact, the invention of the machinery was largely due to the producers' desires to escape constant quarrels with their craftsmen.

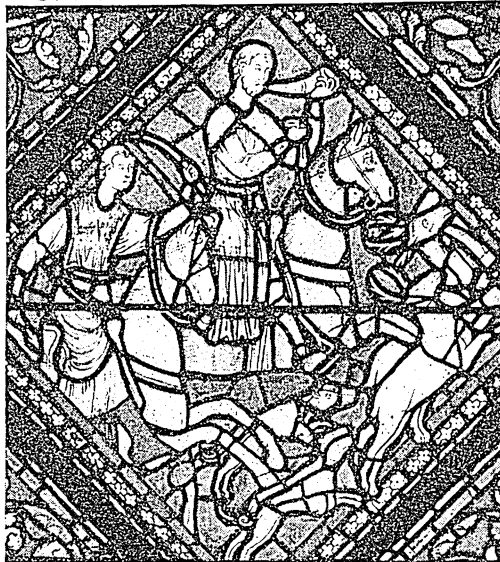
Since the cost of fuel is the greatest single item in production cost, next to labor, the industry has tended to concentrate near supplies of cheap fuel. Hence Pennsylvania, West Virginia, Ohio, Indiana, Illinois, and Oklahoma have come to be the foremost manufacturing states. Natural gas is the best and, as a rule, the cheapest fuel. Illinois, West Vir-

ginia, Pennsylvania, New Jersey, and Missouri lead in the production of glass sand, which has to be as pure as possible. Some manufacturers import glass sand from Belgium, which has the world's purest deposits.

Glass blowing appears to have been invented about the beginning of the Christian era. Up to that time glass was worked by hand, probably with rods or threads at the first form. Perhaps if archeologists ever succeed in finding the real cradle of man, they may find there also the actual origin of glass making. At any rate, the art spread from Mesopotamia, Syria, and Egypt to Rome, thence to Gaul, Spain, along the Rhine, and around the Mediterranean. Constantinople was the art-glass center of the world in the time of the Eastern empire. Syria had its celebrated Damascus glass, and the art flourished in other Mohammedan centers. Venetian glass became famous about the 13th century, and this era of the art lasted until the 18th century. Its development in other countries of Europe has largely been obscured by the fame attained by Venetian artists.

GLOVES. Kid, chamois, and fabric gloves for dress and street wear; buckskin, pigskin, and horsehide for riding, driving, and heavy uses; rubber gloves for surgery, electrical work, and housework; cheap cloth gloves for any rough task—there are gloves for every

GLASS OF SAINT LOUIS' TIME



Rich and precious as gems are the windows of the Chartres Cathedral in France, most of them a gift from Louis IX of France. This one shows St. Eustace hunting, with exquisite color values in brown and cream, within a border of red, blue, and green.

use and every occasion. But the two main classes are leather and fabric gloves.

Leather gloves are made of skins of deer, sheep, lamb, goats, and kids, but the name of the glove does not always tell the animal from which it came. While French kid is considered the finest glove material, more "kid," "doeskin," and "buckskin" gloves are made of lambskin than of kidskin or deerskin. "Chamois" gloves, too, are made from the inner layer of split sheepskin or lambskin, tanned with fish oil to make the material washable. The so-called English "dogskin" or "Cape" gloves are made from the skins of sheep grown at the Cape of Good Hope; American tanners, improving on the English process, make washable Cape leather. "Mocha" gloves are made from Arabian sheepskins, first shipped, it is said, from the port of Mocha which gives its name to Mocha coffee. The mocha finish, producing a leather much like "suède" or undressed kid in appearance, but stronger, is an American invention; it is produced by "buffing" or "friezing" the smooth surface from the hair side, whereas suède is finished on the flesh side. It should be noted that the finest grades of wool usually grow on skins which are much inferior to those which produce heavy wiry wool. The best skins for gloves used to come from Russia; other varying grades come from Spain and eastern Europe.

The dried skins, when received, are soaked and softened in limewater for two or three weeks, cleaned of hair and flesh, cured by the process necessary for the particular kind of glove desired—for example, skins for kid gloves are "tawed" in a custard of alum, eggs, flour, and salt—dyed, and given the desired finish. The "glacé" finish is produced by sizing the grain or hair side.

The prepared skins are next divided into "trunks" or slips, and each trunk is cut by machine-operated dies into a glove ready for sewing, the scraps being used in making the strips for the inner sides of the fingers, etc. Fine dress gloves are sewed over and over ("overseam" or "roundseam"); heavier walking gloves may have one edge lapped over the other (*pique*); very heavy gloves have the edges brought together like an overseam but are sewn through and through ("prixseam" or "saddlers' seam"). Machines for sewing gloves were invented scarcely 50 years ago; though they were long fought by many of the best manufacturers, most gloves on the market are now machine sewn.

Fabric gloves may be made of silk, lisle, cotton, or cashmere or other wool yarn. They may be knitted without seams, or stamped out of a fabric knitted with a special stitch which does not ravel when cut. They are cut and sewed somewhat as are leather gloves, but in larger sizes, being shrunk to the proper size after cutting. Knitted gloves and mittens are made in a number of hosiery mills.

In spite of the introduction of machinery, leather glove-making continues to be a highly skilled occupation, which thrives best in communities long devoted

to it. The finest French gloves have come for centuries from Paris, Grenoble, Niort, and Vendôme. The great English glove center is Worcester. In the United States the industry is carried on chiefly in Fulton County, N. Y., especially in the towns of Gloversville and Johnstown, where it has existed since Sir William Johnson in 1760 brought over some glovemakers from Perthshire, Scotland.

GLUCOSE. To the chemist, the word glucose means a kind of sugar, also called dextrose or grape sugar (*see Sugar*). In ordinary usage, however, glucose is merely another name for corn syrup, which is largely dextrose.

Glucose, or corn syrup, is only about half as sweet as cane sugar. But corn syrup costs much less to make than cane sugar; hence it is widely used as table syrup (mixed with sugar cane syrup) and for sweetening candies and processed foods. When used in canning, in jellies, and in candies, glucose prevents grain- ing, or development of sugar crystals (*see Candy*).

Glucose is made from cornstarch by *hydrolysis*, a chemical process which splits the starch molecules and combines them with water. The starch is treated with water which contains a slight amount of hydrochloric acid. Application of steam under pressure converts the starch; the acid acts as a catalyst to hasten the process. Adding sodium carbonate neutralizes the acid; two filtrations through bone-black, with heating after each filtration to thicken the syrup, complete the process. More intensive processing gives a product which can be refined into corn sugar. Countries such as Germany, which lack cheap corn, make glucose from starch obtained from potatoes.

Commercial glucose contains about 40 per cent dextrose and 40 per cent of a gummy substance called dextrin. The rest is chiefly maltose or malt sugar. Under federal law, use of glucose in food need not be indicated on the label; but glucose sweetening may not be misrepresented as sweetening with another sugar.

Pure glucose, or dextrose, is found in many plants, especially grapes and other fruits. Together with a similar sugar called levulose and traces of other material, it constitutes honey. Glucose is the "animal sugar" which the blood carries as a source of heat and muscular energy. Other sugars must be changed to glucose by digestion; the body can use glucose as it is. It is used therefore in infant feeding and many kinds of illness.

GLUE. Strictly speaking, glue is an adhesive made from the bones, skins, and sinews of animals; but the name often is applied to adhesives made by altering the starch obtained from such plants as corn, arrowroot, cassava, and potatoes into a sticky gum. True animal glue is impure gelatin (*see Gelatin*).

The manufacture of bone glue starts with crushing the bones, and extracting fat by boiling in naphtha or some other solvent. Pressure steaming then dissolves out the glue. The solution is clarified, bleached, thickened by evaporation, and allowed to set. Then it is sliced and dried. Hide glue is made from

clippings of skins and other packing-house waste. These are steeped in lime and then boiled. Fish glue is made from fish skins and bladders, and other fish offal. Waterproof glues are made from casein or from blood albumin. Liquid glue is kept fluid by adding magnesium chloride or an acid preparation. Elastic glue, used in making printers' rollers and for other purposes, contains glycerin.

The glue industry in the United States was founded by Peter Cooper in 1827. Today most glue factories are operated in connection with meat-packing houses.

GLYCERIN. To keep a cosmetic moist and "workable" indefinitely, a manufacturer often uses glycerin. A druggist may use it to prepare drugs which do not dissolve well in alcohol or water. It can be used as an antifreeze in automobile motors, in preparing tobacco, and as a liquid in hydraulic apparatus. It enters into cellophane and many plastics; and in time of war enormous quantities are used to make nitroglycerin, dynamite, and other explosives.

Glycerin is valuable for such services because it dissolves many substances, resists evaporation, and acts as a lubricant, and because it tastes sweet and is harmless in drug and food preparations. Also it is easily obtained and comparatively cheap. All vegetable and animal fats consist largely of glycerin united to fatty acids. The acids can be split off with an alkali, making soap and leaving glycerin (*see Soap*). This is the usual source of supply.

For extra supplies in wartime, or in countries that run short of fats and oils, glycerin can be made by fermenting sugar with special yeasts in certain salts. Propylene gas from petroleum refining can be made into glycerin by treatment, first with chlorine, then with an alkali.

In peacetime the United States uses from 140 to 150 million pounds a year. The outbreak of war in 1941 created difficulty because it cut off the coconut and palm oil from the East Indies which soap makers had used in addition to animal fats. Efforts were also made to increase supplies from Africa and South America, and to use the babassu nut from a Brazilian palm.

Chemists classify glycerin as a trihydric alcohol and call it *glycerol* (*see Alcohol*). The name is from the Greek word *glykys*, which means "sweet." Certain compounds with phosphoric acid, the glycerophosphatides, provide special fats such as lecithin in eggs and nerve tissue. Glycerin weighs one-fourth more than water; it boils at 554° F. and freezes at -40°. Related, sweet-tasting dihydric alcohols are called *glycols*. Ethylene glycol, $C_2H_4(OH)_2$, is used as an antifreeze and also to cool airplane engines because of its high boiling point, 387° F.

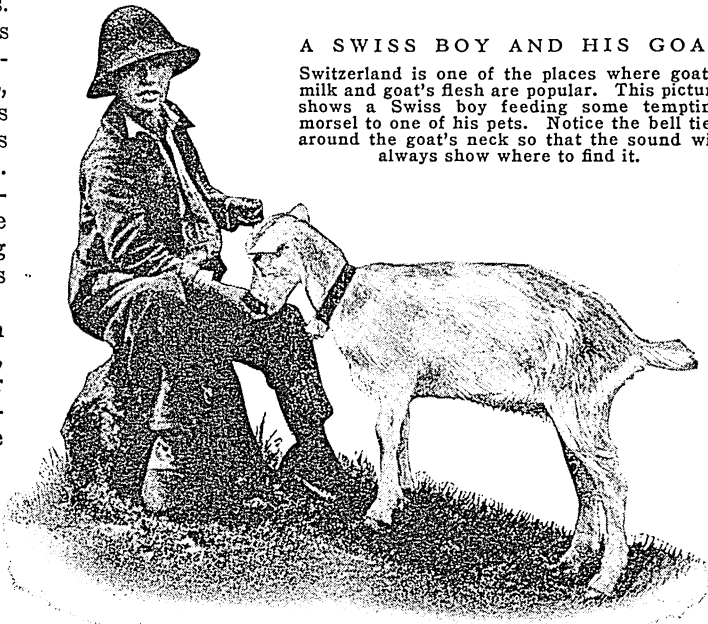
GNAT. Any of the very small two-winged insects are commonly called gnats, but the name is not a scientific term. Some of the insects which are called gnats are the smaller mosquitoes, midges, buffalo gnats, and gall gnats.

GOAT. Though the name of the useful goat has long been a synonym for evil, it is far from deserving its ill reputation. No domestic animal is more widely distributed and none has been of greater service to man. It gives edible nutritious meat and wholesome milk; fine leather is made from its hide, and an exceptionally strong durable cloth from its hair; and, most important of all, it is extremely hardy and can grow fat on coarse vegetation on which other animals would starve. Part of the goat's evil reputation doubtless comes from the strong odor and surly temper of the males, and from the frequently acrid taste of the flesh and milk. In America it is little used for food, but some people prefer its milk and flesh to that of the cow.

Goats are closely allied to sheep, but are distinguished by the beard on the chin of the males. Wild goats are found only in Europe, northern Africa, and the Himalaya Mountains. Of the ten species the

A SWISS BOY AND HIS GOAT

Switzerland is one of the places where goat's milk and goat's flesh are popular. This picture shows a Swiss boy feeding some tempting morsel to one of his pets. Notice the bell tied around the goat's neck so that the sound will always show where to find it.



ibex is the most interesting (*see Ibex*). The Rocky Mountain goat of North America is an antelope and not a goat (*see Antelope*).

Domesticated goats (*Capra hircus*), which are thought to be descended from the wild goat of Persia, have been bred in many parts of the world from the earliest times. The Angora goat, native to Angora, in Asia Minor, has a history that may be traced back to the days of Abraham. This type has long spiral horns, and an abundance of long white silky hair, from which a strong cloth is made, called mohair. It is extensively bred in Turkey, South Africa, and parts of the United States, especially Texas. Brushwood forms one of its favorite articles of diet and so herds of Angoras are much used for clearing brushland. The flesh of this species is edible at all ages and is often sold as mutton.

Milch goats are found in all European and Asiatic countries, the Toggenburg and Saanen breeds of Switzerland being the best. Because of the wholesomeness of goat's milk, especially for invalids and sickly children, the number of milch goats in the United States has greatly increased. When its size is considered, a good goat is a larger producer of milk than the cow, and it costs much less to keep one. It is for the latter reason that the goat is sometimes styled "the poor man's cow." A cheese highly prized in Switzerland is made from goat's milk.

Kashmir (India) and Tibet are the home of the Cashmere goat, from whose beautifully soft silky under-coat are made the famous Cashmere shawls. Attempts to introduce this breed in the United States have been unsuccessful. These Cashmere shawls are exceedingly costly, for it takes the fleece of ten goats to make one shawl a yard and a half square, and the weaving, which is all done by hand, takes about a year. Some especially beautiful patterns have been sold for as much as \$1,500.

The hides of young kids are used extensively for gloves and shoes, though much of the so-called kid-leather is an imitation, made from the skins of rats and dogs. The skin of the Angora, with the hair intact, is often used for rugs and robes. Goat-skins are also used in the manufacture of shoes, music rolls, morocco for book bindings, and other articles. So great is the demand that more than \$30,000,000 worth are imported into the United States every year.

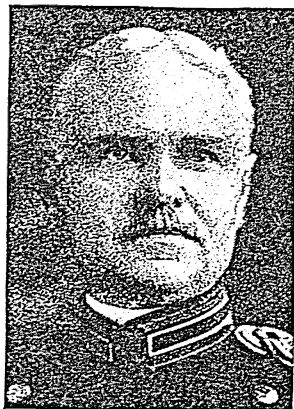
GOETHALS (*gō'thāls*), GEN. GEORGE WASHINGTON (1858-1928). Imagine yourself in jungle-clad Panama during the construction of Uncle Sam's canal. It is only 7:00 a.m., but Colonel Goethals of the United States Army, appointed "boss of the big job" in 1907, is already off in a little yellow car, called by the canal workmen the "brain wagon." Tall and gray, with bronzed face and blue eyes, he drops off now and then to watch men digging or blasting. A word here, a question there, and on he goes, "always on the job."

The direction of the greatest engineering task in history required not only a master engineer, but a true organizer and commander of men. With a genius for detail, Colonel Goethals organized the labor army of 40,000 into a model of smooth-running efficiency and industrial contentment. Though he was equipped with the power of a Russian czar, no humble dark-skinned laborer but could go to him personally. A man of force and resources, strong in personality and able to inspire confidence and energy in others, he brought the canal to completion in 1914, nearly a year ahead of schedule.

"Peace hath her victories, no less renowned than war." Goethals proved himself a hero-soldier of peace. Indeed, his peace victory in Panama was even

vaster in its effect on the destiny of nations than many a military triumph.

Experience had fitted him for the great undertaking. Born in Brooklyn, N.Y., he was graduated from West Point in 1880, second in his class. His rise in the army through the lower grades was slow, but he was made captain in 1891. He taught military engineering at West Point (1885-87); was chief engineer of volunteers in the Spanish-American War (1898); was for a time a member of the Board of Fortifications; and had taken the advanced course in the War College (1905) before his engineering opportunity came at Panama.



GEORGE W. GOETHALS
Master Engineer of the Panama
Canal.

After the completion of the canal Goethals was made major general and appointed first civil governor of the Canal Zone (1914-16). After the United States went to war in 1917, he was made acting quartermaster general of the army, and filled many other posts of importance in that trying time. After retiring from the army in 1919 he became a member of an engineering firm to engage in reconstruction work in America and Europe. Princeton University and the University of Pennsylvania both honored him with the degree LL.D. In addition to special thanks from Congress for his work in Panama and the Distinguished Service Medal for his services in the Quartermasters' Department, the French government made him a commander in the Legion of Honor. (See Panama Canal.)

GOETHE (*gō'tē*), JOHANN WOLFGANG VON (1749-1832). This great German poet once said that he "lived" his poems and that they made up "a great confession." He meant that he found life so interesting, and even small happenings so full of meaning that when he had caught the secret of the interest or had come to understand the meaning, his joy or sorrow had turned into something that became a poem or a story. His zest for life and his lively imagination he inherited from his mother. She was only 18 when he was born and she once said, "My Wolf and I were children together." From his father, however, he inherited a certain sedateness and steadiness. So he was always making the most of life and getting the most out of it, yet never letting himself go or losing his grip on himself. He seemed always to find the golden mean in life. Thus in what he wrote there is a great deal of wisdom as well as beauty and charm.

Goethe's greatest work, 'Faust', a dramatic poem in two parts, is in a special sense the "confession" of his whole life. From early youth, when he learned the story of Dr. Faustus from a puppet play, until he penned the last scene shortly before his death, there was scarcely a period of his life that Faust was entirely out of his mind, scarcely a period that did not add something to the great work that was grow-

ing under the poet's hands. Faust desires all knowledge, to squeeze the lemon of life dry. Unsatisfied by the results of his studies, he turns to magic. He conjures up the devil in the shape of Mephistopheles and makes an agreement with him. In Goethe's 'Faust', Mephistopheles must gratify Faust's every wish; if he can satisfy Faust, Faust's soul is to belong to Mephistopheles. Faust learns that pleasures are not happiness. His wishes become purer and reach their highest point in a grand project that is to benefit others. The moral height he has reached calls the powers of Heaven to his aid and in response they wrest his soul from the clutches of Mephistopheles. (See Faust Legends.)

Goethe's other great work was his novel 'Wilhelm Meister'. This work, too, Goethe wrote at various times, changing the plan from time to time. But through it all Wilhelm Meister is seeing life and learning in the school of experience. Life is the best teacher, Goethe thought. He wanted the fulness of life for himself, and he tried to show others how to live fully.

Goethe's long life was, indeed, a full life. His boyhood was spent in Frankfort-on-the-Main, which was in the cross-currents of the history that was then making. A boy like Goethe could not help but be stirred by the happenings around him, even though they did not directly affect the course of his life. He was taught at home by his father, together with his only sister Cornelia, a child scarcely less gifted than himself. Both excelled in literary exercises. Wolfgang wrote his first dramas for a puppet theater which his grandmother had given him.

From Frankfort he went to the University of Leipzig and from there to the University of Strasbourg. At Strasbourg he met the critic Herder, who directed his attention to Shakespeare and to folk poetry (the ballads and songs that seem to have no author and live only in the recitation and singing of the common people). Such literature offered more naturalness and warmth and real life than was to be found in 18th-century poetry. The songs Goethe now wrote were indeed marked by greater naturalness and truth to life, and made the beginning of a new and great era in German literature. His first drama of note, 'Goetz von Berlichingen with the Iron Hand', is the story of a staunch but lawless baron of the 16th century, and shows the influence of Shakespeare. A translation of it influenced Sir Walter Scott to write 'Marmion' and 'The Lady of the Lake',

"with all that followed from the same creative hand." Many others were similarly influenced.

Goethe won the friendship of the Duke of Saxe-Weimar, a ruling prince of Germany, who made him a counselor of state at Weimar. Goethe took his duties seriously. He gave particular attention to developing the agriculture, forestry, and mining of the duchy, and thus began his studies in the natural sciences, in the course of which he foreshadowed the Darwinian theory of evolution. Later he was, for 22 years, the director of the duke's court theater. Other great men were also attracted to Weimar, notably Herder, Wieland, and Schiller, and Weimar thus became the intellectual center of Germany.

In 1786-88 Goethe made a journey to Italy, drawn there by his interest in Greek and Roman art. He himself regarded this first visit to Italy as the turning point in his life. He saw that the "natural" expression in poetry had gone too far (though he had not carried it too far in his own works), and his experience in Italy gave him a broader and sounder view of literature, art, and life. Goethe might always be trusted to find something to steady him, even in circumstances that swept others off

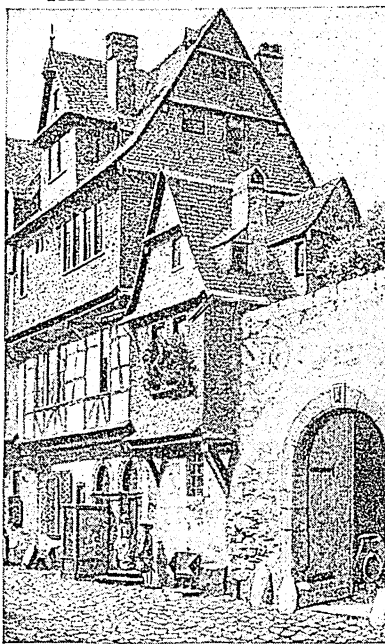
their feet. The Greek spirit of measured beauty is found in Goethe's play 'Iphigenie at Tauris', and in the delightful little epic of 'Hermann and Dorothea'.

Goethe's friendship with Schiller, the best loved of German poets, is one of the famous literary friendships of history. It was helpful to both. It gave Goethe new inspiration, and a surer guidance to Schiller's somewhat too impetuous genius. The death of Schiller in 1805 was deeply mourned by Goethe. The friendship is commemorated in Weimar by a statue of the two poets standing with hands clasped.

Goethe was a remarkably handsome man. A bust of him in the ducal library at Weimar represents him as Apollo. Goethe also impressed those who met him by the splendor of his mind and his distinction of manner. Napoleon, after meeting him, exclaimed, "Voilà un homme!" ("There is a man!") There have been greater men and greater writers, but few have been so great both as men and as writers.

Goethe's chief works, in addition to his prose writings and songs, odes, etc., were: 'Goetz von Berlichingen' (1773); 'Werthers Leiden' (Sorrow of Werther), 1774; 'Iphigenie auf Tauris' (1787); 'Egmont' (1788); 'Torquato Tasso' (1790); 'Reineke Fuchs' (Reynard the Fox), 1793; 'Wilhelm Meisters Lehrjahre' (Wilhelm Meister's Apprenticeship), 1796; 'Hermann und Dorothea' (1797); 'Aus meinen Leben: Dichtung und Wahrheit' (1811, 1812, 1814, 1833, autobiography); 'Faust', complete (1831).

THE BIRTHPLACE OF GENIUS



In this picturesque house in Frankfort-on-the-Main, Goethe was born in 1749, and here he spent his boyhood. Frankfort was a progressive city and stimulated the genius of its most famous son.

The METAL that Measures the WORLD'S WEALTH



GOLD. Although gold is widely distributed over the earth, it occurs mostly in such small quantities that it cannot be profitably extracted. It is even found in minute quantities in sea water. Despite the fact that gold has been mined from remote antiquity, so little is obtained in return for the time and labor expended that gold always was the most precious metal until recent times when demand arose for others still more difficult to obtain in quantity. The total world output of gold since the discovery of America, about 39,000 tons, could be cast in a cube measuring only about 40 feet each way. Less than one-half now is in money stocks, and perhaps a third has been used in the arts and crafts. Where the rest is, nobody knows.

Most of the gold mined in the earlier days was produced in the Spanish Peninsula, Greece, Asia Minor, India, and the Ural Mountains of Russia. After the discovery of the New World, great supplies were obtained from Central and South America, but the total production from that time to the discovery of the California gold fields was less than the average annual production today. An enormous jump in production resulted from the discovery of the California deposits (1848) and other great fields, the most important of which are, with dates of discovery: Australia (1851); British Columbia (1858); New Zealand (1858); British India (1884); Witwatersrand, South Africa (1886); Alaska (1897).

Gold is mined in many countries. From one-third to one-half of the annual world production is mined in South Africa. Russia ranks second in annual world production, and Canada and the United States are rivals for third place. Most of the Canadian output

FOR gold men have toiled and died; wars have been waged for it, and it has inspired crimes of the deepest dye. "To what dost thou not compel the minds of mortals, accursed greed for gold?" indignantly asked the Roman poet Vergil. On the other hand, the search for gold has been one of the most important motives in the spread of civilization. The "pot of gold at the end of the rainbow" has been the reward for which men have braved the terrors of unknown lands, and the prospector has blazed the trail for the settler to follow. The Spaniards who conquered Mexico and South America were seeking gold; it was the gold rush of '49 that started the settlement and development of the Pacific coast; and the first important start of Australia toward greatness followed the discovery of gold in 1851. Similarly the discoveries of gold in Alaska and South Africa were great factors in the development of those countries.

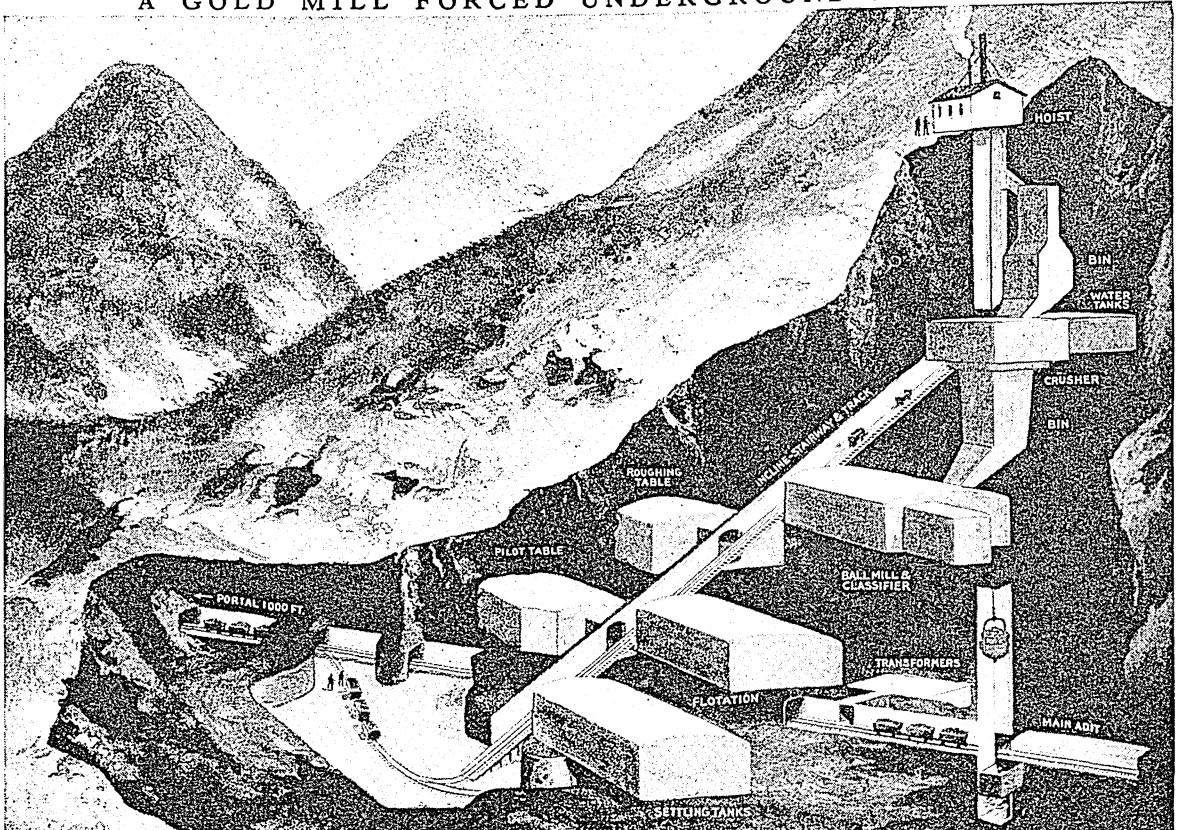
comes from Ontario; and in the United States, California, Alaska, South Dakota, Colorado, and Arizona are the principal sources. Australia, Mexico, Japan, Chosen, Colombia, India, and the Philippines are other important producers.

Some gold mines are very deep. A mine in the Kolar district of Mysore, India, is more than 6,000 feet deep. The Morro Velho mine in Brazil and a

mine in the Witwatersrand have gone down more than 8,000 feet. Most gold is found in the "native" or free state in quartz veins or alluvial sands, often combined with silver. Small quantities are found in ores of lead, iron, tellurium, and copper.

There are two principal methods of mining gold: (1) "placer" mining for alluvial deposits, and (2) "lode" or "quartz" mining, where the gold is in solid rock. Placer mining was known in ancient times. Gold washing as early as 4,000 B.C. is shown in pictorial rock carvings in Egypt. The legend of the Golden Fleece may have been suggested by the use of fleeces to catch gold in ditches and flumes. In placer mining nature has already done the greater part of the work. In the process of wearing down the "eternal hills" by erosion, gold, being one of the heaviest of minerals (19.27 times as heavy as water), naturally goes to the bottom of streams. There it is deposited in the form of scales or nuggets, for the most part in the same shape in which it was originally held in the rock. The size of the particles varies from fine powder (gold dust) to the great Australian "Welcome stranger" nugget, weighing 2,520 ounces—the weight of a medium-sized man. The separation of gold from the gravel and sand is accomplished on the same principle that has been in operation

A GOLD MILL FORCED UNDERGROUND BY SNOW



A mining company in the mountains of Ouray County, Colorado, devised this scheme to escape the snow slides which were constantly destroying their property. The plan shows all the parts of the mill tunnelled out and excavated beneath the surface of the hill. All that is visible above ground is the small hoist-shed.

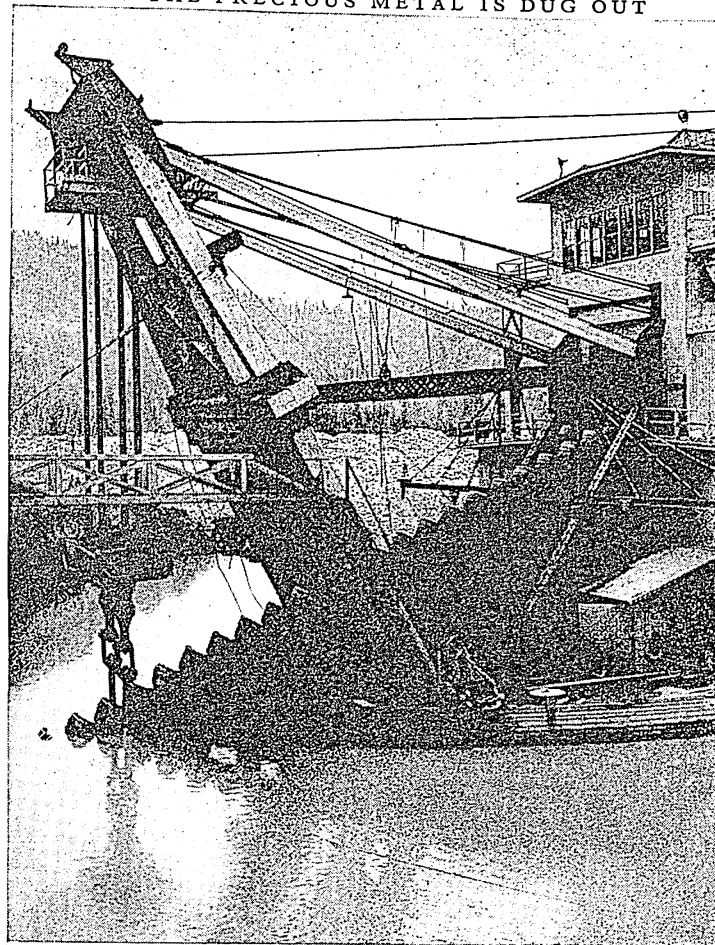
in the processes of nature—that is, the gravel is washed with water so that the gold sinks to the bottom. This may be done in a prospector's pan, or on a larger scale in sluices, which are inclined troughs having riffles and crevices to catch the gold. The gold-bearing gravel may be fed into the sluices by hand, or washed into them by huge hoses, as in *hydraulic mining*, or lifted into them by great buckets, as in *gold dredging*. To collect and retrieve gold within the sluicing apparatus, mercury may be added. This readily unites with gold, forming an amalgam. Then the amalgam is heated until the mercury vaporizes and the gold is left free.

The known placer deposits are now mostly depleted, and most of the world's gold today is obtained by lode mining. At the large mines, mills separate the gold from the ore after it is taken out of the rocks. In the mill, the chunks of ore are crushed and watered to form a pulp which can be treated by physical, chemical, and mechanical processes. Each mine strives to adapt the sequence, number, and nature of its milling processes to the peculiar qualities of its ore. Some of the gold can be extracted by *amalgamation*. In plate amalgamation, the gold is caught from the "pulp" (the wet pulverized ore) as it passes over copper plates covered with mercury. Another milling

process widely used is *gravity concentration*; the pulp is spread over sloping tables covered with corduroy or other materials that catch the heavy gold while the lighter matter in the pulp keeps on moving ahead. One of the major processes today is *flotation* (see Metals). This can be used profitably with ores in which the gold is free or closely associated with sulphides, carbons, and base-metal minerals. In some ores, however, the gold cannot be seen—even through a microscope. This is one of the conditions calling for *cyanidation*. A solution of sodium cyanide or potassium cyanide is poured over the concentrated pulp, dissolving the gold. From this solution the gold is precipitated by zinc dust, or by electrolysis. Cyanidation, adopted after 1890, replaced *chlorination*, in which roasted ore was treated with chlorine gas to form gold chloride. Gold was then precipitated from the chloride with various reagents. The amount extracted was much less than with cyanide.

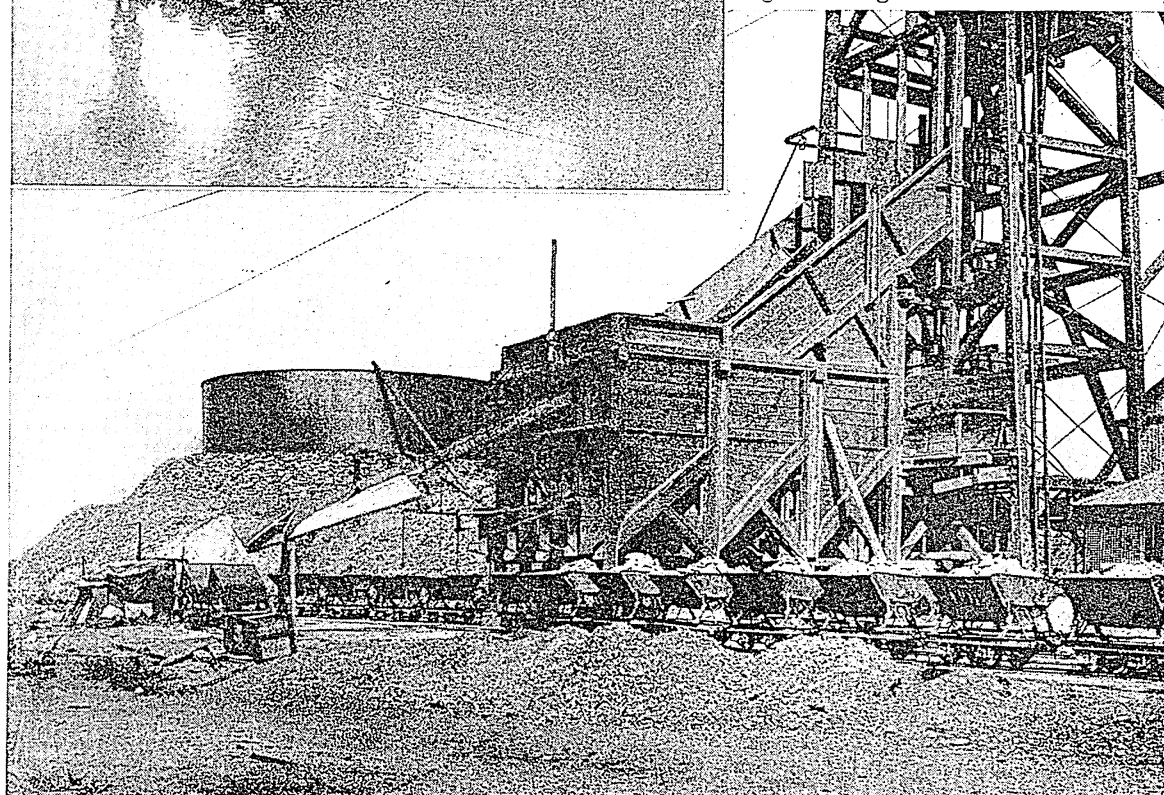
As first extracted from its ores gold nearly always contains some silver, copper, or other metal, which must be separated. This separation, or refining, is done at refineries or at the mint, by electrolysis or by treatment with chemicals. Since pure gold is too soft for ordinary use, it is nearly always alloyed with copper or silver, or both. The gold coins of the

HOW THE PRECIOUS METAL IS DUG OUT



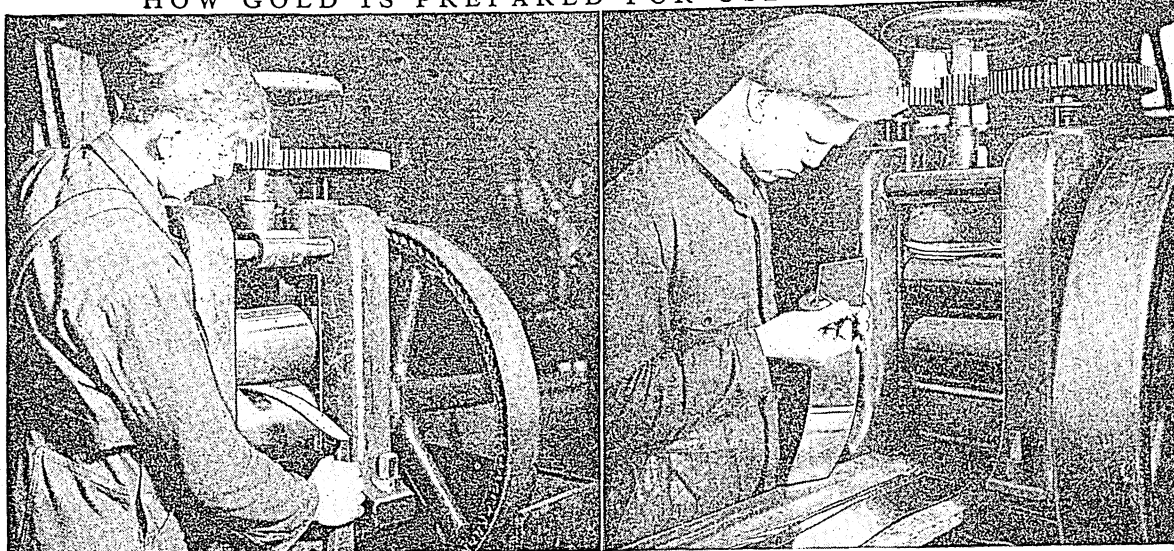
United States are alloyed with copper. These metals change the color, copper making the alloy redder than pure gold, and silver whiter. The proportion of gold contained in an alloy is expressed in two ways: in *carats*, that is, the proportion on a scale of 24; or in *fineness*, on a scale of 1,000. Pure gold is 1,000 parts, or 24 carats fine. Gold with 18 parts pure gold and 6 parts of alloy is 18-carat gold, or 750 parts fine. The legal standard for Great Britain's gold coins is 22 carats, or 916.6 parts; but most countries, including the United States, have used 21.6 carats or 900 parts. Until 1934, "fine" or 24-carat gold was valued by law in the United States at \$20.67 an ounce. Then Congress authorized the President to fix its value within certain limits (*see Money*).

Gold is the most malleable of metals; it can be beaten to $1/250,000$ of an inch. It is placed between strips taken from the thin outside membrane of the intestine of cattle, and several layers are pounded at the same time. The resulting gold leaf is used for lettering signs on the glass of doors and windows,



These machines represent two of the principal methods used in obtaining gold — dredging and mining. In the upper picture is the chain of buckets with which the big dredge scoops gold-bearing gravel from the bed of the California river where it operates. Within the dredge is machinery which extracts the gold. Below is the entrance to a gold mine in the Transvaal, South Africa, showing cars loaded with ore.

HOW GOLD IS PREPARED FOR USE IN INDUSTRY

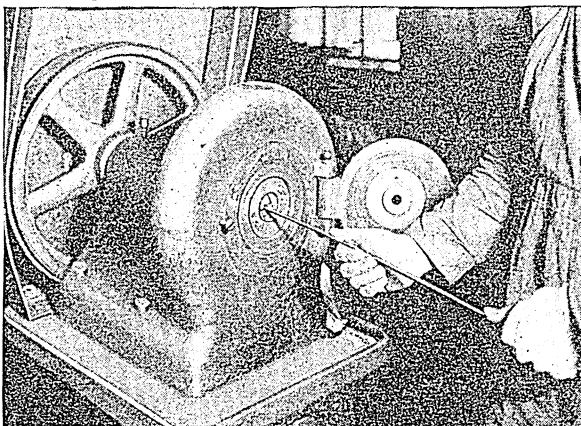


These two pictures show how gold is reduced to thin strips for the use of jewelers and others. A bar of gold is passed through the rollers and flattened. A turn of the hand wheel on top reduces the space between the rollers and the bar is passed through again. The process continues until the desired thinness is obtained.

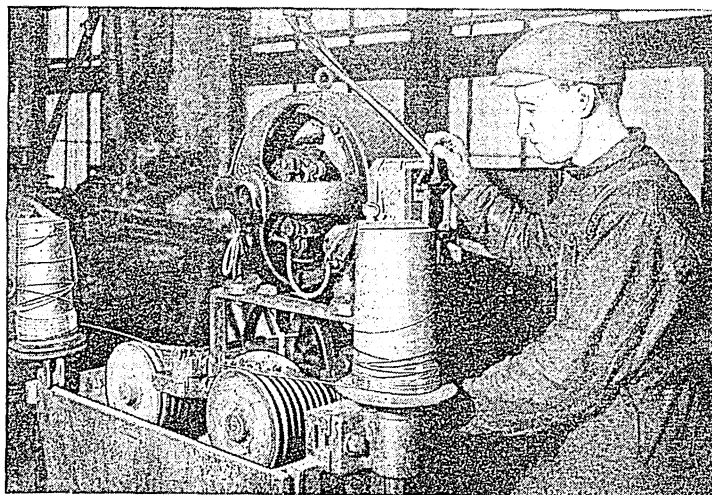
for interior and sometimes exterior decorations, for picture frames, and for experimental work in electricity.

Gold is also the most ductile of metals. Wires compounded of silver and gold have been drawn to such fineness that 20,000 of them would be less than an inch thick, and a length of 500 feet weighs only one grain. Gold lace is made of thin gold wires so fine that from 1,100 to 2,000 yards weigh but an ounce. These wires are flattened into ribbons and wound over silk thread. Cheaper varieties are made of thin copper wire plated with gold.

Rolled gold, which is often used for watch-cases and jewelry, is produced by applying thin sheets of gold to a plate of alloy and rolling them together until the gold and the alloy are firmly welded.



Here we see the making of gold wire. As the wire passes into the machine, many little hammers beat upon it and reduce its diameter.



This machine shows another method of wire making. The wheels draw the wire through a succession of dies, each of which makes it thinner.

Gold resists chemical action to a greater degree than any other common metal. One of the few acids which will dissolve it is a mixture of nitric and hydrochloric acids, which early experimenters called *aqua regia* ("royal water") because of this power. The resulting chloride of gold, in combination with certain other chlorides, forms salts which are called gold chloride and are used in photography. In combination with tin chloride, gold chloride produces a fine purple pigment, called purple of Cassius, which gives a rich pink, rose, or red color to glass, pottery, and enamel. About three-fourths of the world's production of gold is used for commercial purposes. The rest is made into coins, or held in bars as a reserve to maintain the value of paper money. (See Alloys.)

GOLDENROD. Tossing and waving in the autumn winds along dusty roadsides and in swampy fields, this spendthrift weed heralds the end of the year's floral pageant like a glorious sunset bringing to the close a beautiful day. Because of its wide distribution in the United States, the goldenrod is favored by many for adoption as the national flower. It offers a veritable Chinese puzzle botanically, for an accurate description and identification of the 85 or more known species would be a hard task for the most learned botanist.

The goldenrod belongs to the family of composite flowers and is akin to the thistle. Only two or three species are found in Europe. One species, the so-called "white goldenrod" or "silver-rod," lacks the characteristic golden hue. Another species, common in the pine barrens of New Jersey, gives off an anise-like fragrance when crushed, and its dried leaves and flowers were formerly used to make a medicinal tea. The goldenrods have a prolonged season of blooming, and the bright flowers and the ease with which the nectar is to be obtained attract many insects. When the flower clusters fade, the seeds tipped with fine feathery hairs are wafted in every direction, later to be sought by the goldfinch and the song sparrow when the winter's store of food runs low.

Scientific name of goldenrod genus; *Solidago*. The blue-stemmed or woodland goldenrod (*Solidago caesia*) has an unbranched stem of bluish hue and lance-shaped leaves; the flowers grow along the stalks in the axils of the leaves. *Solidago uliginosa* is the bog goldenrod, with stem 2 to 4 feet high, and with flowers forming a compact terminal spike. The showy goldenrod (*Solidago speciosa*) attains 7 feet in height with widely branching stem often stained with red. The early or plume goldenrod (*Solidago juncea*) is branching but shorter; its plumes are often dried for winter decoration. The Canada goldenrod (*Solidago canadensis*) is probably the largest, showiest, and most common of the family, flourishing from Newfoundland to Florida, and westward to British Columbia and Arizona.

GOLDFISH. Swimming proudly in its suit of burnished gold or bright red jacket with black or silver trimmings, the goldfish knows nothing of its humble ancestor, the dull-colored carp. Yet the wonderful variations of color and form which we find so attractive were produced by the skill and infinite patience of Chinese and Japanese breeders. For centuries individual variations were carefully bred and selected until the golden color was firmly fixed, and innumerable forms, from the beautiful to the grotesque, were produced. But blood will tell; and as soon as the care of the breeder ceases, the goldfish tend to lose their brilliant coloring. Specimens that escaped from the fountains in Washington to the Potomac River have produced young that returned to the original greenish hue.

Some of the most valuable goldfish are not golden at all. For example, the "fantail" is occasionally a brilliant and showy black, and others are virtually white. One of the prettiest varieties is the "fringe-tail," whose enormous shimmering tail produces effects that a dancer might envy as the little fish moves in the sunlight. Probably the ugliest kind is

the one most prized in the Orient. This is the "telescope fish," so called because of its large and bulging eyes, which the Japanese are continually trying to make larger and more bulging. In the United States goldfish are so popular as pets that more than 20,000,000 are sold each year.

Scientific name, *Carassius auratus*. It is a native of China, whence it was introduced into Japan and Europe. Goldfish should be fed only once a day, in the morning at a regular time, and only as much as they can eat at once. The best aquarium is one in which water plants are growing. The ordinary fish globe should not be used, since the curving sides allow but a small part of the surface of the water to reach the air (see Aquarium).

GOLDSMITH, OLIVER (1728-1774). There are few more eccentric or more lovable characters among literary men than the reckless, irresponsible, happy-go-lucky, generous Goldsmith. He was born in a little village in Ireland, where his father was a simple kindly clergyman, much like Dr. Primrose in the 'Vicar of Wakefield'. Young Oliver was regarded as "a stupid blockhead" at school, and seemed a most unpromising lad in every way. At Trinity College, Dublin, his escapades brought him into disfavor with the authorities, and here he fell into the habit of squandering what little money he had and getting into debt, but he managed somehow to obtain his degree in 1749.

At the urging of his family Goldsmith now spent two years studying theology, but when he presented himself as a candidate for holy orders in the Church of England, he was rejected. He made an attempt at law, but failed in this also. Then he went to Edinburgh to study medicine. After remaining there a year and a half, he set out on a year's tramp through Europe. Earning his way by playing the flute he wandered through Flanders, France, Switzerland, and Italy. He came back with a medical degree, though how he obtained it no one ever knew; and it was of little service to him, for he met with no success in practice as a physician.

Failing in various other occupations, Goldsmith turned to literature as a last resort. In his little garret at the top of "Breakneck Stairs" in London, he wrote essays, reviews, histories, etc., most of which have been forgotten. But among these were a series of observations on English civilization, afterwards published (1762) as 'The Citizen of the World'. These essays attracted the attention of Dr. Samuel Johnson, the great literary leader of the day. He befriended Goldsmith and made him a member of his famous club, to which the actor Garrick, the artist Reynolds, the historian Gibbon, the brilliant orator and statesman Edmund Burke, and other famous men belonged (see Johnson, Samuel). In this brilliant circle Goldsmith was laughed at for his oddities and blundering ways, but loved for his goodness of heart and unfailing good humor.

His writings brought him some means, but as a result of his love of gay clothes, and fine dinners, his habit of gambling, and the ill-advised generosity

which led him to help any beggar who sought his aid, he was always in debt. In his 47th year he fell ill of a fatal fever, which was aggravated by his own attempts to cure himself and his constant worry over his many financial troubles.

"Let not his frailties be remembered," said Dr. Johnson after Goldsmith's death; "he was a very great man." This verdict has been accepted by the

in an artificial age to appeal to human sympathy and love of nature. His comedy 'She Stoops to Conquer' (1773) has been played again and again, and its hearty fun never grows stale.

GOLF. Golf is one of the few games for both old and young, for champions in this difficult and fascinating sport have been as young as 18 and as old as 60. More than any other game perhaps, golf calls for a spirit of courtesy and fairness. A player stands quietly aside while his opponent makes his strokes. He assists in every way to give this opponent an equal chance with himself, and should a player lose a ball the other searches for it as diligently as if it were his own. Golf also puts a player on his honor, for he alone keeps track of his own score. These facts, combined with the skill required to excel and the excellent physical exercise obtained, usually in the midst of attractive scenery, fully entitle golf to be known as "the royal game."

The ideal golf course consists of 18 "holes" at various distances apart, from about 100 yards to more than 500 yards. At the beginning of each hole there is a "tee," a level, smooth, closely-mowed plot of ground, from which the players "drive off" into the "fairway," which is the name given to the broad avenue of turf leading to the hole itself. For 200 yards, perhaps, this fairway is smooth and undulating, with no obstructions, though woods and tall grass may flank it on both sides. Then a "hazard"—an obstruction either natural or artificial, such as a brook or a ditch or a mound of earth fronted by a sand-pit—may cut across the fairway and form a trap for the unwary player. If the golfer hits his ball into one of these traps he may have considerable difficulty in knocking it out, but if he plays skilfully he remains outside the traps and is able to approach "the green," which lies at the end of the hole, without wasting any strokes.

The Green, the Flag, and the Hole

The "green" is a plot of ground of no regulation size or shape, but usually about 30 or 40 feet in diameter. Here the grass is cut close, and in the center is a hole about 4 inches in diameter, lined with metal and designated by a flag or marker on an iron rod or bamboo pole. When the golfer is at a distance from the green, the flag indicates the correct direction for his stroke. As soon as the player succeeds in "sinking" his ball in the hole and his opponent has done the same, they both move on to the next tee and continue to play in the same manner until they have

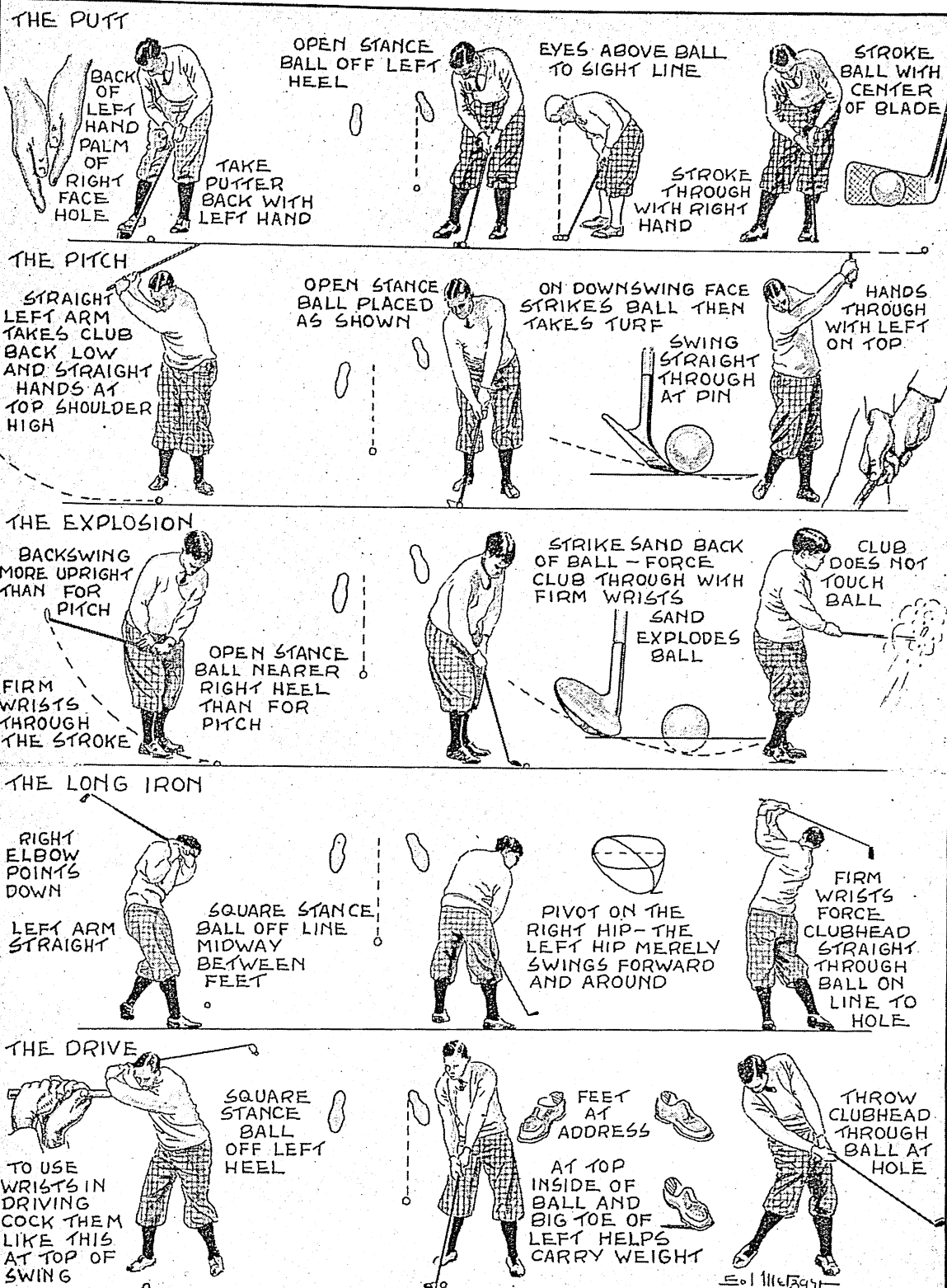
THE CAREFREE OLIVER AND HIS FLUTE



What a lovable, carefree genius Oliver Goldsmith was! Here we see him going across the fields with the beloved flute with which he earned his way in his year's tramp through Europe. Goldsmith needed a little mixture of the practical in his make-up, as this practical and somewhat prosaic age of ours needs a touch of Goldsmith's appreciation of certain great things of life that money cannot buy—the simple joy of living, and the play of imagination.

literary world. Of all his works 'The Vicar of Wakefield' (1766) is the favorite. Dr. Primrose, the simple, true-hearted clergyman, whose happy faith triumphs over all misfortunes, and the blundering Moses, so like Goldsmith himself, are among the characters that are never forgotten, while the simple, wholesome village life pictured in this novel never loses its power to charm. Much of the same charm is shown in 'The Deserted Village' (1770), one of the few poems

SOME OF THE STROKES IN "THE ROYAL GAME"



These pictures show the correct "stance" (position of the body) and the right way to execute some of the varied strokes that make golf so fascinating a game. Every detail of these shots must be practiced with the utmost care, and any player who hopes to excel must be careful to get them right when starting to learn the game. Bad golfing habits are quickly formed at the outset, and once a player acquires them, he overcomes them only with the greatest difficulty.

made the round of the 18 holes. Some golf courses consist of only nine holes, and in that case the usual practice is to make two rounds.

The object of the game is to send the ball into each of the holes successively in the fewest possible number of strokes. In "match" play each hole is counted separately. The winner is the one who has the most holes to his credit when the course has been completed. In "medal" play, the golfer who makes 18 or 36 holes—according to agreement—in the lowest total number of strokes is the winner, whether or not he wins the most holes. Whenever a player and his opponent complete a hole in the same number of strokes the hole is "halved" and counts for neither.

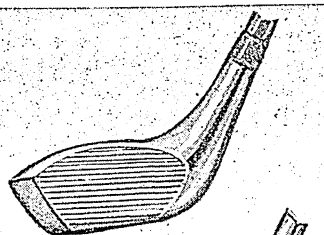
The golfer may play with one other (a "twosome"), with two others (a "threesome"), or with three others (a "foursome"). A foursome gives the best sport.

The ball, about 1.6 inches in diameter, is made of many strands of rubber wound around a core which is usually of solid rubber or steel. The core is sometimes a liquid or paste in a rubber container, with the idea of giving greater resiliency to the ball. The gutta-percha casing is variously marked to lessen wind resistance and give greater carrying power.

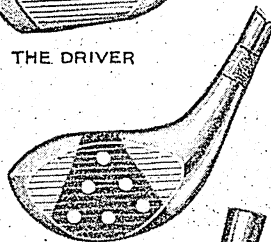
Most players use six or eight clubs of different kinds, each adapted for its own particular kind of stroke. The clubs have slender shafts about three feet in length, made of hickory or steel tubing, and strong wooden or iron heads with which to hit the ball. When driving off at the beginning of each hole, the player may "tee up" the ball on a little mound of sand or some other device to enable him to strike it most effectively. For driving, a wooden-headed club called a "driver" is generally used. Two hundred yards is a fair drive, but crack golfers can average 250 yards or better.

The other clubs—the "brassie," the "spoon," the "midiron," the "mashie," the "niblick"—are variously designed for driving the ball

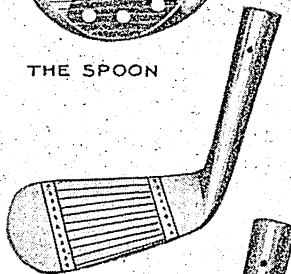
THE CHIEF GOLF CLUBS



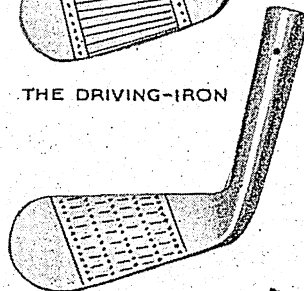
THE DRIVER



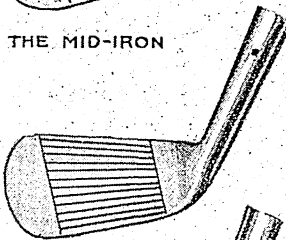
THE SPOON



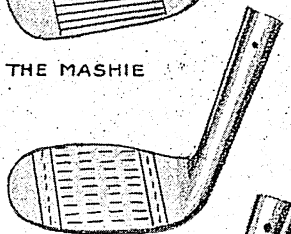
THE DRIVING-IRON



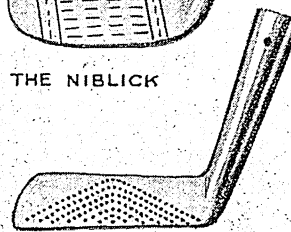
THE MID-IRON



THE MASHIE



THE NIBLICK



THE PUTTER

These are the seven clubs most useful to the golf player.

low and far, or raising it high in the air and letting it fall "dead," or clearing obstacles, or "lifting" it out of holes or tall grass. On the green the player uses a short straight-faced club called a "putter." The players' clubs are usually kept in a bag which is carried by a small boy called a "caddie." Many of these boys have developed later in life into champions at the game.

The history of golf runs far back into the early centuries. The Romans, soon after the beginning of the Christian era, played a game with a mallet and a leather-covered ball stuffed with feathers, called *paganica*; the French in early times had a game akin to golf called *jeu de mail*; and the Dutch played a stick-and-ball game on the ice called *het kolven*. In each of these games the object of the player was to send the ball so it would strike a mark such as an upright stick. While the Dutch and the French were still hitting at marks, the Scotch refined the game by making holes in the ground to receive the ball. In 1457 the Scotch were playing the game so enthusiastically that Parliament, either fearing that the game might have a questionable moral effect on the people or that it might supersede archery, forbade the game, and in fact did not cease to interfere with the sport until 1491.

In the United States a crude form of golf was played as early as 1659. The authorities of Fort Orange—now Albany, N. Y.—passed an ordinance in that year forbidding the people to play golf along the streets on account of damage to windows and danger to pedestrians. Not until 1890, however, did modern golf secure its first real foothold in the United States and Canada. Today, it is said, there are nearly three million golfers in North America. The game has had much to do with the increasing number and popularity of country clubs, of which there are five thousand in the United States alone. Probably the most famous golf course in the world is that of the Royal and Ancient Golf Club of St. Andrews in Scotland.

The rules for the game have an interesting history. So long as the game was practically confined to a few clubs in Scotland, tradition and custom, passed from generation to generation, made rules largely unnecessary. But the spread of the game, with elaborate championship contests, created the need for a detailed code. In response to a widespread public demand, the St. Andrews club established a large standing committee and published decisions which long were the rules of the game. Later, interclub associations became important legislative bodies.

In the United States the rule-making function has been discharged by the United States Golf Association and the Western Golf Association. American rules, however, conform closely to those of Great Britain, and international competitions and committee conferences tend to keep the two uniform.

GOMPERS, SAMUEL (1850-1924). As president for nearly 40 years of the American Federation of Labor, Samuel Gompers is one of the outstanding figures in the American union labor movement. Born in London, at the age of ten he went to work for a shoemaker, but soon became apprenticed to a cigar-maker, and learned that trade. He came to New York with his parents in 1863, and was active in the Cigar-Makers' International Union for many years. Then in 1881 he helped to found an organization which in 1886 became the American Federation of Labor (see Labor Organizations), and served as its president, except for one year, until the end of his life.

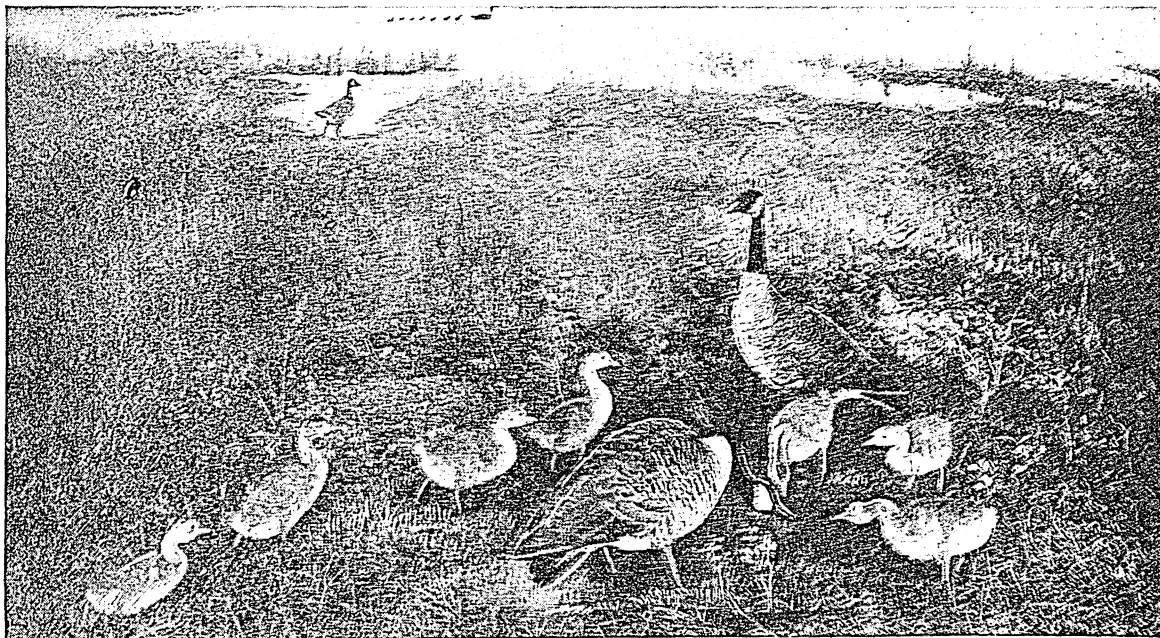
During this long period he maintained a firm leadership of the labor movement, guiding it into moderate channels. He knitted together a power-

ful body of nearly 4,000,000 men and women, of every race, language, trade, and condition. He constantly opposed the formation of a separate labor party, advocating the use of the indirect influence of the organization in voting for candidates who are friends of labor. Some of the success of this policy may be seen in the laws passed for the benefit of the working man—employers' liability laws, the eight-hour day on government contracts, etc. No capitalist fought more determinedly against socialism and "bolshivism" than did Samuel Gompers, who declared these movements economically unsound, socially wrong, and industrially impossible. Industrial conciliation, he believed, is the remedy by which the laborer should seek to gain his ends. The vigorous stand he took in support of the participation of the United States in the World War fittingly crowned a remarkable career.

GOOSE. The goose is a bird of wide popularity. Through "Mother Goose" it belongs to the nursery; the fable of the "goose that laid the golden egg" takes it into the schoolroom, where later it figures as the heroic bird that saved the city of Rome, and as furnishing Tiny Tim's Christmas dinner in Dickens' famous 'Christmas Carol'. Sportsmen prize the wild goose, and the domestic goose is of great importance to housewives not only for its flesh and eggs but for its feathers which supply their pillows and feather beds. Goose fat is largely used in place of lard for cooking, and from the livers is made the pâté de foie gras for which Strasbourg is famous.

There are about 30 species of wild geese, belonging to the same family as the ducks and swans. The

WILD GEESE AT HOME FOR THE SUMMER IN CANADA



The picture shows Mr. and Mrs. Wild Goose escorting their children over a marsh in Saskatchewan, and seeing to it that the youngsters eat and grow strong in preparation for the autumn, when they must make the long flight to the Gulf of Mexico. The picture is from a group in the American Museum of Natural History.

male, called the "gander," resembles the female in plumage. All breed in cool and temperate regions, some in the Arctic Circle. All migrate south for the winter. Geese live to be at least 30 or 40 years old.

Of the European wild geese the "graylag" is the most representative. It ranges over nearly the whole of Europe and northern Asia, and is the original of most domestic geese. China is the home of the "swan-goose," the largest known variety, and the parent stock of the domestic geese of the Orient. The "Cape Barron goose," which is remarkable for the shortness of its beak, is found in Australia.

The "Canada goose" is the most familiar of American wild geese. It is a grain-feeding bird and its flesh is most palatable. Breeding in Canada or the northern United States, it stops in its southward migration to visit the grain and stubble fields of the great northwest, often remaining in the Dakotas until mercury has reached 20° below zero. This is the harvest time for sportsmen, and often family larders are provided with meat from this source for the entire season. The birds are about 40 inches in length, light gray plumage below and darker grayish brown above, with a black head. In their spring flight north they are welcomed as an unfailing sign of coming summer. They fly high, in a V-shaped wedge, their joyous honking claiming attention of young and old:

Hark what a clamor goes winging through the sky!
Look, children! Listen to the sound so wild and high!
Like a peal of broken bells,—kling, klang, kling—
Far and high the wild geese cry, "Spring! It is spring!"
—Celia Thaxter.

The "snow goose" is a pure white arctic bird that migrates to the Gulf States in America and to Japan on the Asiatic coast. They are still numerous along the Pacific coast during the winter. The "brant" is a small goose common throughout the Northern Hemisphere. In early autumn these birds come by the thousands to the coasts of the United States, and are a plentiful and valuable source of food supply for our tables.

Domestic geese date from a very remote period, as they are shown on the monuments of ancient Egypt. Wing-feathers of the goose feathered man's arrows in the Middle Ages, and supplied him with quill pens until steel pens took their place.

Geese belong to the order *Anseriformes*. Scientific name of Canada goose, *Branta canadensis*; of American brant, *Branta bernicla hrota*; of snow goose, *Chen hyperborea*.

GOOSEBERRY. The tart flavor of the gooseberry is enjoyed in sauce, jam, and marmalade, but does

not greatly tempt one to pick and eat the raw fruit. Even as the fruit ripens, changing from green to a rich dark purple, the acid flavor lingers, especially around the coarse seeds. So the gooseberry is not very popular among garden fruits, and much of our supply comes from the bushes growing wild all through the northern part of the United States. Varieties of the gooseberry are also

native to the north temperate regions of the Old World, but everywhere the cultivation of the fruit has been neglected with the exception of England. There cultivation began in the 16th century, with the result that English markets have gooseberries as large as plums and sweet enough to eat just as they are picked from the bush.

The gooseberry is a hardy spiny shrub closely related to the currant. Scientific name, *Ribes grossularia*.

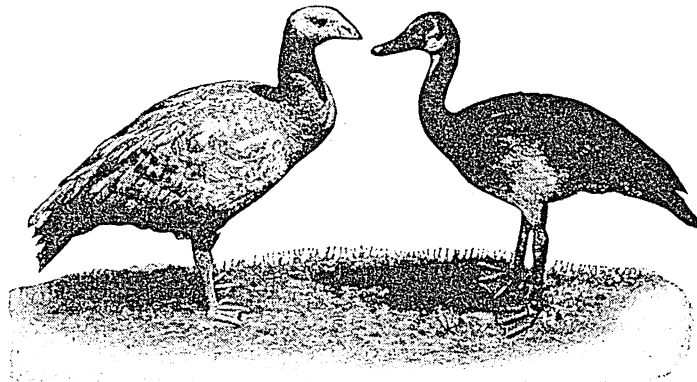
GOPHER. In the early days French settlers gave the name "gopher" to several species of burrowing animals of the rodent family. The name comes from the French *gaufre* ("honeycomb"), and was given because the little animals honeycomb the ground by burrowing in it. They do much damage to the crops and are considered a great pest by the farmers.

The prairie pocket gopher commits its depredations in the fertile prairie region of the farther northwest. It is about as long as a small rat, with a body considerably thicker; in the skin of each cheek is a large pocket or pouch in which to carry stores of food. The fore feet are very strong and are equipped with long claws for digging.

With his hind feet the gopher scrapes from beneath his body the dirt the front feet have dug and throws it back a distance of 8 or 10 inches. When a little pile has been made in this way, the gopher turns around and putting his forepaws in front of his nose pushes the dirt before him through one of his "cellar doors" and so makes the little piles called gopher hills.

The gopher's teeth make something like 200 strokes a minute. The enamel plates of the molar teeth are arranged in such a way that 38 distinct single cuts are made with every forward thrust of the jaw and

TWO GEESSE OF DISTANT LANDS



To meet the sharp-nosed goose on the left, you would have to go to Australia, for he is a Cape Barron goose with an extremely short beak like a turkey's. He can get around on land much more rapidly than the ordinary goose, but he lacks the family fondness for swimming and flying. Facing him is the African spur-winged goose, who gets his name from a long spur on each wing. He has more of the family nose, as you see.

28 by the back stroke. Multiply that by 200 and it amounts to over 13,000 cuts every minute.

To keep food for winter use, gophers have regular storehouses — pantries, as it were — to which they carry roots and other food in their cheek pockets. In

MR. GOPHER AS A BUSINESS MAN



A Gopher is a clumsy looking fellow, but how he can cut and stow away the roots! With those long upper front teeth he anchors himself to his job; then the lower incisor shoots back and forth like a steam drill until he has cut off a piece of root and passed it into his mouth. The digging and shoveling are done with that short stout nose and those long powerful curved claws that seem almost too big for him.

one gopher storehouse in the winter time were found nearly 50 tiger lily bulbs, gathered the previous fall and carried through a tunnel from the tiger lily bed to the gopher pantry. Gopher burrows are extended year after year, and in many cases the tunnels dug by a single gopher in 12 months would measure a mile or more if straightened out and placed end to end. The tunnels are full of crooks and turns, caused by going around stones or following "leads" of soft earth.

The so-called "striped gopher" of the Central States is really a ground squirrel but it is no less troublesome. Natural enemies of these pests are the weasel and the gopher-snake. Farmers also try to keep their numbers down by traps and poison.

Pocket gophers are a large family, the United States having three genera with 78 species and subspecies, which vary widely in size and color. Scientific name of the prairie pocket gopher, *Geomys bursarius*.

GORDON, GEN. CHARLES GEORGE (1833-1885). "Chinese Gordon," as he was commonly called, was a British officer whose love of danger, combined with a religious enthusiasm which verged on Oriental fatalism, crowded his career with romantic adventures. One of the secrets of the extraordinary deeds he accomplished was his genius for leadership, especially among non-European peoples.

He was the son of a British general, was educated at the Royal Military Academy at Woolwich, and began his career in the British army in 1852 with a lieutenant's commission. He served with conspicuous gallantry in the Crimean War, and afterwards in Asia. At the age of 30 we find him commander of the "Ever Victorious Army" of China, putting down the Taiping rebels who sought to drive out the unprogressive Manchus and to establish "the reign of eternal peace." In 1864, within 18 months after Gordon had taken command, the ten-year-old rebellion which had cost millions of lives was relentlessly suppressed. The grateful Chinese thereupon conferred on Gordon the yellow jacket and the peacock feather of a mandarin.

The next nine years of his life were spent in the more prosaic but perhaps more useful work of constructing forts in England and serving on various international commissions. Then in 1873 he accepted service under the Khedive of Egypt as governor of the Egyptian equatorial province. For seven years he labored to establish law and order, but his work was not very successful.

In 1884, four years after he resigned this commission, he was sent back to the Sudan by the British government. His commission was to bring out of the region the Egyptian garrisons endangered by the revolt of the "Mahdi" or Prophet, a religious leader whose aim was not unlike that of the Taiping rebels in China. But in disregard of his orders General Gordon sought to hold the district and was besieged in the city of Khartum. For ten months the city held out; when it finally fell (Jan. 26, 1885), two days before a British relief expedition reached it, the whole garrison, including its brave but erratic commander, was massacred.

The death of Gordon raised a storm of indignation in England against the slowness of the government in sending aid.



CHARLES GEORGE GORDON
One of England's Warrior Heroes

Gladding, then prime minister, pointed out that Gordon had disobeyed his orders in not leaving the Sudan when he could, but public opinion could not forget his chivalrous heroism and regarded him as a martyr. So he was — to his own headstrongness and the spirit of imperialism, which, however, did not rule the councils of the Liberal government then at the helm in England. Tennyson wrote the epitaph for his tomb in Westminster Abbey.

ONE OF AMERICA'S GREATEST CONQUERORS

The Man who Vanquished the Deadly Mosquito

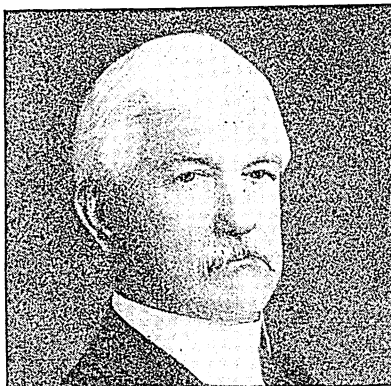
GORGAS, GEN. WILLIAM CRAWFORD (1854-1920). It is a great thing to uphold the honor of one's country on the battlefield, especially when the conflict is in defense of liberty, of justice, of the rights of men peaceably to rule their affairs. But there are conquests even greater than those over hostile armies—such are the conquests over the forces of disease and death and the suffering of little children. And so we may truly say that one of the greatest conquerors that America ever produced, a man worthy to rank with Washington or Grant or Pershing, was an army officer who only late in life rose above the rank of colonel; who conquered malaria and the deadly yellow fever in Cuba and the Panama Canal Zone and thus made possible the construction of the Panama Canal; and who at his death, at the age of 66, was recognized as the world's foremost sanitarian.

The family of William Crawford Gorgas was well known in Alabama, where the boy was born shortly before the Civil War. His father was a general in the Confederate army and the collapse of the Southern cause brought the family a full share of hardships. "I first came to Baltimore," said the son, at one time, "about 45 years ago—a ragged, barefoot little rebel, with empty pockets and still more empty stomach. My father had gone south with Lee's army. At the fall and destruction of Richmond, my mother's house, with all that she had, was burned, leaving her stranded with six small children. She came to Baltimore, and was there cared for by friends. These memories are vivid with me, and can never be effaced."

Young Gorgas received his education at the University of the South at Sewanee, Tenn., of which his father had become president. After graduating from Bellevue Medical College, New York, he entered the United States Army as a surgeon, and while stationed at Fort Brown, Tex., had his interest first aroused in the terrible scourge—yellow fever—which he was later to do so much to combat and conquer.

Dr. Gorgas in the Spanish-American War

During the Spanish-American War Dr. Gorgas served as chief sanitary officer of Havana, Cuba, which for years had been notorious as a center of yellow fever. There he won his first world fame by ridding the city almost entirely of this plague. He was practically the first to apply the new discoveries—that both malaria and yellow fever can be spread by the bites of certain species of mosquitoes, which in



WILLIAM CRAWFORD GORGAS

turn have become infected by biting persons infected with these diseases (see Mosquito).

In reward for his work at Havana Dr. Gorgas was created colonel by special act of Congress, and shortly afterward was appointed as chief sanitary officer of the proposed Panama Canal.

The story of the great work which he did there is told more fully elsewhere (see Panama Canal). Colonel Gorgas and his men worked especially in four great ways: They destroyed the homes of mosquitoes during the larval stage within a hundred yards of all human dwellings; they destroyed all protection for adult mosquitoes; they screened all houses with wire screens; and they destroyed all breeding-places, either by draining stagnant waters dry or sealing them with crude petroleum, which spreads a film over the surface and kills the larvae.

The War against the Death-bearing Mosquito

Never was there known so great a "pouring of oil upon troubled waters"; never was there known so silent a battle between an army of hundreds on one side and hundreds of millions on the other. On one side were a few hundred men—doctors and ditchers, drainers and dispensers, oilers and clerks and sanitary inspectors—guarding 40,000 or 50,000 laborers and their families, scattered over 450 square miles in about 40 camps and villages. They were doing the biggest piece of engineering that has ever been done on the earth, digging a way from sea to sea, cutting up a mountain for the sea to pass through, and building huge walls to hold in the sea as it passed. On the other side were millions of mosquitoes of the race *Stegomyia* and *Anopheles*, born in stagnant waters, but emerging with their powers of death to fly through every door and window to suck the blood of any human being and poison the life-blood of all Panama, as their ancestors had poisoned it for ages, with yellow fever and malaria.

Without the remarkable work of Colonel Gorgas in stamping out these diseases, the canal might never have been completed, certainly not without appalling loss of life. It has been estimated that in the ten years that the canal was building he saved more than 70,000 lives, and \$80,000,000. His achievement marked an epoch in the history of sanitation, and in the work of making the tropics habitable for the white man. It was not too much now to expect, as Colonel Gorgas prophesied, that "some day a case of yellow fever will be regarded as a medical curiosity."

When the canal was finished in 1914, Colonel Gorgas was promoted to be surgeon-general of the United States Army, and the next year he was made major-general. In 1920, while on his way to study yellow fever in Africa for the British government, he died in London. His body was brought to the United States for burial in Arlington National Cemetery.

GORILLA. Largest of all the manlike apes is the gorilla, a native of the dense forests of equatorial Africa. Ever since the first explorers penetrated the African jungles, this animal has been a pet subject for terrifying stories, most of them far from the truth. Though extremely powerful, the gorilla is not as monstrous or ferocious as is commonly believed. When walking erect, which he rarely does, the average gorilla has a height of only about five and one-half feet; yet he would weigh 350 pounds. His legs are short, his arms long, and his heavy, broad-shouldered body is covered with long dark hair which turns gray in old age. The gorilla can walk or run on all fours, but does so on the knuckles of his hands. He can climb trees with more agility than a man. It is the face of the gorilla that is so terrifying. With black, nearly bare skin, deep-set eyes rimmed with bushy brows, a flat nose, and protruding jaws, the gorilla's features are indeed ugly. Unless cornered, he will not attack, but when excited he thumps his chest with both fists and breaks out into wild roars.

Gorillas roam about in small family groups, feeding on the shoots of bamboo, wild celery, and other tender plants. They sleep on the ground, or sometimes in trees, but have no permanent abode. A preserve for gorillas, the *Parc National Albert* in the Belgian Congo, was established in 1925 and now has an area of about 700 square miles. (See Ape.)

GOTHS. First of the northern barbarians whose successive assaults brought low the might of Rome were the Visigoths or West Goths. Where the Goths first came from is not definitely known. There were stories told by their old men of a time when their people had dwelt far to the north, on the shores and islands of what is now Sweden. Then had come long slow wanderings, through the forests of western Russia, until they reached the shores of the Black Sea. In a hundred years of contact with the Romans, they learned many things, especially the Christian religion.

This was spread among them by the efforts of a convert of their own race, a saintly man named Ulfilas. For more than 40 years he labored, first

making a Gothic alphabet into which to translate the Bible, and then teaching his people the new faith. This Bible translated by Ulfilas is centuries older than the earliest writing which we have in any other Teutonic language, so its historical value is very great.

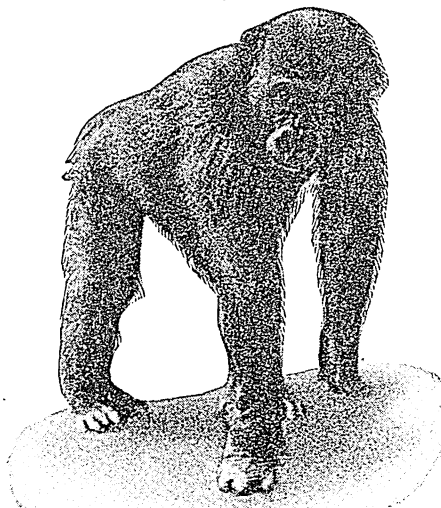
For a time the Goths ruled a great kingdom north of the Danube River and the Black Sea. Then the Huns swept into Europe from Asia, in 375 A.D., conquering the Ostrogoths or East Goths, and forcing the Visigoths to seek refuge across the Danube within the boundaries of the Roman Empire. In a battle fought near the city of Adrianople, in 378, the Visigoths defeated and slew the Emperor Valens. For a time they lived peaceably on Roman territory; then, on the death of the Emperor Theodosius in 395, they rose in rebellion under their ambitious young king Alaric, and overran a large part of the Eastern Empire. Rome itself fell into the hands of the impetuous Goths in 410 (see Alaric).

Alaric's successors led their people out of Italy and set up a powerful kingdom in southern Gaul and Spain. In the year 507, the Visigoths in Gaul were defeated by the Franks and were forced beyond the Pyrenees. For 200 years their kingdom in Spain flourished. It did not come to an end until 711, when the Moors crossed over from Africa, and in a terrible eight-day battle destroyed the Visigothic kingdom. (See Spain.)

The Ostrogoths for a time formed part of the vast horde which followed the king of the Huns, Attila, settling in the lands south of Vienna when the Hunnish kingdom fell apart. Their national hero was Theodoric the Great, a powerful and romantic figure who became king in 474. When a boy he

had been sent as a hostage to Constantinople and had there been educated. In 488 he invaded Italy, with the permission of the emperor at Constantinople. After several years of warfare Theodoric captured and slew Odoacer, a barbarian who had there usurped the Roman power and founded a powerful kingdom, which included all Italy together with lands north and east of the Adriatic Sea. His reign was one of the ablest and best in this period, and his kingdom was one of the great "might-have-beens" of history. He failed largely because no permanent fusion was effected between the barbarians and the Christian-Roman population. All his wise plans for bringing this about proved futile because the Ostrogoths, in common with most of the German barbarians, had been converted to Arianism, an heretical form of Christianity, and so were hated by the orthodox.

A BABY GORILLA



Not an unpleasant face — do you think — for a Gorilla? But he's only a baby. Later he will develop tusklke teeth and a ferocious scowl.

After Theodoric's death, in 526, the generals of the Eastern Empire reconquered Italy (see Justinian I, Emperor of Eastern Roman Empire). After their last battle (near Mount Vesuvius, in 552) the Ostrogothic nation marched out of Italy, to mingle and merge in other barbarian hordes north of the Alps, and disappeared from history.

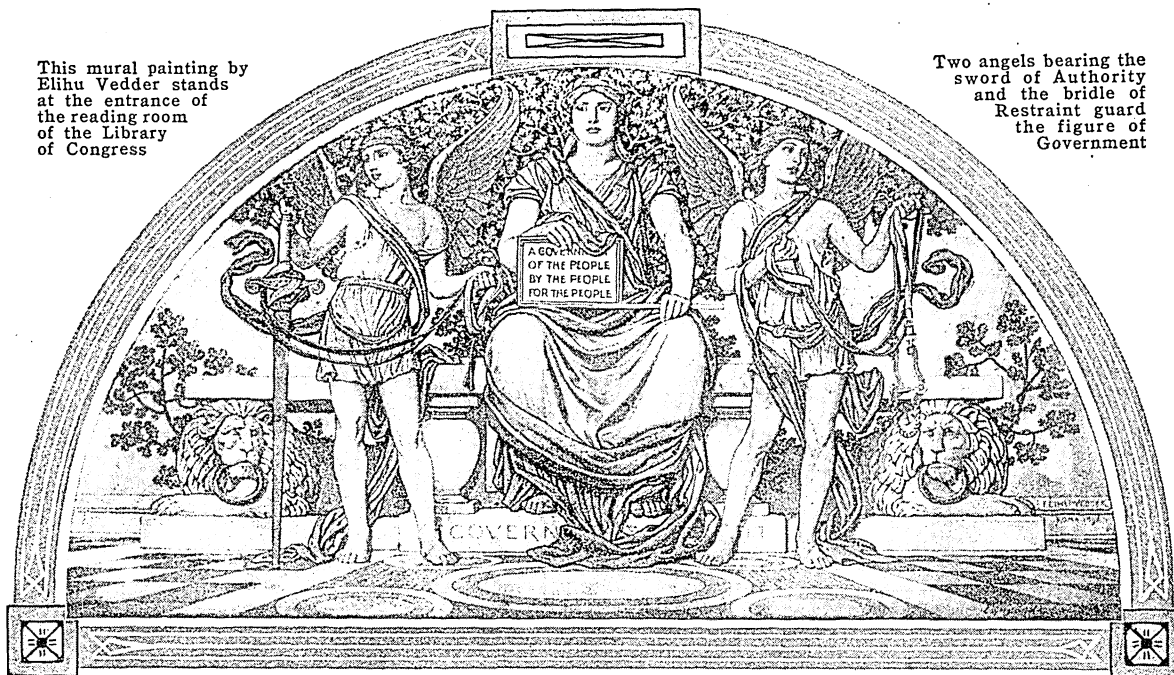
GOURDS. Over the back porch or the milk house of an old-fashioned farmhouse a gourd vine is almost sure to be found trailing its downy leaves and pretty white blossoms. In pioneer days this vine was more than a luxuriant climber, for from the hard-skinned thin-fleshed shell of its fruit were made such everyday necessities as dippers, spoons, and water-bottles.

The "gourds" or fruits of the various species assume many strange shapes and range from a few inches to five feet in length. One variety grown in America is called the "vegetable sponge" or dishcloth "gourd," because the fibrous character of its interior when dried adapts it for these uses. From the neck of the calabash gourd of South Africa are made pipes highly prized by smokers.

Gourds belong to the family *Cucurbitaceae*, and are distinguished from the closely related pumpkins, squashes, and melons by having white instead of yellow flowers. In Europe the members of these edible species are also popularly known as gourds. The American bottle gourd is *Lagenaria vulgaris*.

FAMILY to NATION—The Story of POLITICAL INSTITUTIONS

This mural painting by Elihu Vedder stands at the entrance of the reading room of the Library of Congress



Two angels bearing the sword of Authority and the bridle of Restraint guard the figure of Government

GOVERNMENT. The word "govern" is derived from the Greek word which meant to "steer" a ship. To steer the ship of state is to govern; and the science or art of steering it is government. The existence of government implies a state, and a state cannot exist without government. A state is a community of persons permanently occupying a definite territory, free from control by other states, and possessing an organized government which the people obey. The government is the agency through which the state exercises its authority, makes its laws, and controls its inhabitants.

In the United States the word "state" is also applied to the 48 state organizations. When the 13 American colonies revolted in 1776 they first formed a confederation, which was a union of sovereign states. In 1789, when the present Constitution went into effect, these states gave up many of the rights

of independent states, but the word was already fixed by popular usage as the name of the separate governmental units. A government, like that of the United States, representing a union of states, and deriving its powers from them, is called federal or federated. (See State Governments.)

Complex Duties of Modern Government

Modern governments are highly complex because the problems they deal with are complex. We expect the government of today to protect us from disease, from foreign enemies, from fire, from pestilence, and all kinds of danger that it is possible to prevent. We expect the government to educate the people, to dispose of sewage, to pave and light streets, to distribute our mail, to dig our canals, to regulate our immense transportation systems, to prevent crime and poverty, and so to organize our laws and courts that justice is done between individuals and that each

person shall have an equality of opportunity for his development and achievement.

Laws: What and Why They Are

Many think that laws are made only to forbid the doing of things that are wrong. As a matter of fact, the great majority of our laws do not forbid wrongdoing but rather deal with matters of convenience and efficiency of the group and its individual members; such laws, for example, as those providing upon which side of the road people should drive. Even a family cannot get along without some laws or rules, such as those setting the times for meals. The school-room must have its time for beginning and dismissal or the teacher and pupils could never work together. You cannot play even the simplest of games without rules and frequently an umpire to enforce them.

Another common mistake is to regard law as omnipotent. Some people think that when there is any problem to be met, all you have to do is pass a law about it. Laws may be very helpful in some cases and in others they may do actual harm. Whether a given evil can be remedied by law is frequently a difficult question. It will depend upon the nature of the evil and the wisdom of the law. Moreover, if the people will not obey the law, particularly in a democracy, the law is futile, and its failure may weaken respect for other laws. Only such laws will be effective, therefore, as have the approval of a substantial majority of the population.

There is also a mistaken notion that law interferes with liberty. Unwise laws may destroy liberty, but wise laws that regulate the conduct of each so that one does not interfere with the liberty of others are the real basis of such freedom as we actually enjoy. Were it not for such laws, criminals could take away our property, destroy life, burn down homes, and commit other equally atrocious crimes. We have the liberty to enjoy our homes and feel secure in our property only because of laws that forbid interference with the freedom of the individual, and that command the general respect which leads to strong enforcement. (See Law.)

How Government Developed

In the early stages of human development, long before recorded history began, there was neither state nor government. Doubtless it took many thousands of years for men, groping their way through the mental darkness of savagery, to form the idea of a state. It is supposed that as the primitive population increased in size, group association naturally arose, beginning with the family and the tribe (see Family and Tribal Life).

When men began to domesticate animals and to practise agriculture, they needed larger organizations. Presently these agricultural groups developed into city-states. Commerce between groups began to grow and the groups began to develop the machinery of government to deal with the new problems.

One of the fundamental elements in associated living is the fact that people vary. Some are stronger,

some wiser, some more honest, more skillful, more capable. A few are natural leaders; the many are natural followers. Out of this difference in capacity and ability grew the social and economic stress of mankind. The strong and the clever became a ruling class which furnished chiefs, war leaders, priests, and kings. The least capable of all became slaves. Through many centuries the idea persisted that it was the right of some to rule, the duty of the many to be ruled. Ruling became hereditary in families and rulers gained absolute power over their "subjects."

Origin of Kings

The first kings usually were successful warriors who had won many battles and captured much land over which they were able to hold sway by force of arms. The laws of those early kingdoms were chiefly concerned with raising armies and collecting taxes. In Egypt, Babylonia, and Assyria, religion was so closely identified with government that laws came to have a supernatural sanction and a supposedly divine origin. The kings came to be thought of either as lesser gods or as the ambassadors of gods, and the laws which they made were considered sacred.

It was not until the time of the Greek city-states that government and laws began to assume a different aspect in the eyes of the people. About five centuries before the birth of Christ a group of Greek scholars, known as Sophists, taught that "man is the measure of all things." This new doctrine gave rise to the idea that man had a right to determine his own rules of conduct, and that he might inquire into the basis and nature of the government under which he lived; if he found that government to be unsuited to his needs he had the right to change it.

Origin and Spread of Democracy

Out of these ideas grew the beginnings of democracy. The word "democracy" is a union of two Greek words: *demos*, meaning "people," and *kratos*, meaning "rule." Actually, however, only a small part of the people in the Greek city-states enjoyed full rights of citizenship. Among the Romans some advances in democratic government were made by granting popular rights and extending the privileges of citizenship. But the Romans were a practical people. Though they were much interested in conquering and governing, they were not particularly interested in the theory of government. It is noteworthy that only a few English words, such as *senate*, describing particular organs or officers of government are of Roman origin; almost without exception the words which relate to the theory of government, such as *autocracy* and *democracy*, came from the Greek.

In the centuries immediately preceding the establishment of the empire in 31 B.C. Rome, though a republic in name, was ruled by an aristocracy, the senate. Literally the word *aristocracy* means "rule of the best." The ideal aristocracy comprised men of superior wisdom, who ruled conscientiously in the interests of the people. When those in power allowed their own selfish interests to predominate, discontent

arose among the people, and the power of the senate gradually declined until Julius Caesar seized supreme power, and his successor Octavian (Augustus) established the Roman Empire, which was essentially an autocracy, though the forms of the republic remained in existence for some time.

Teutonic Changes in Roman Policies

The tribes of barbarians which overran the Roman Empire in the 4th and 5th centuries of our era did not have a fully developed system of government; but they had one principle which had a great influence on later governmental systems. This was the idea that every man has a certain liberty which no law can take away from him. In other words, they believed that government existed for the benefit of the individual, as against the Roman idea that the individual existed for the benefit of the government. The Teutonic tribes carried their democratic idea of the relationship between the citizen and the government across the sea to England, where it thrived and became the basis of governmental forms which are the foundation of many existing political systems, including the American.

In English history, whenever kings went too far in their opposition to this theory, they were defeated. It was one of the great events in the history of government when, on a memorable June morning in the year 1215, King John of England, surrounded by angry barons, against his will signed the Great Charter (Magna Carta). This famous document established the individual rights of subjects against kings, a turning point in history. Today Great Britain retains the form of monarchy, but its spirit and most of its political institutions are those of a democracy.

Chief Types of Government

The authority of a state to rule is its *sovereignty*. In a democracy all the citizens possess an equal share of the sovereignty. Democracy in the United States is associated with the republican form of government and representative democracy. (See Democracy.)

In an autocratic form of government, sovereignty belongs to the rulers. If the state is governed by a small ruling class, it is an *oligarchy*. No modern state is governed by an avowed oligarchy, although control of the state by a minority in its own interest is often referred to as oligarchic rule. If the state is governed actually or in theory by a single ruler, the king, it is a *monarchy* (from the Greek word meaning "sole ruler"). A limited monarchy is one in which the ruler's power is limited by the power of the nobles, by a constitution, or in some other way. All existing monarchies are, in theory at least, limited; and in most the king is important chiefly as a symbol of the unity of the state. England, Denmark, and the Netherlands are examples of limited monarchies.

A new form of autocracy, which developed after the World War of 1914-1918, is the *totalitarian state*. Under the totalitarian system, absolute sovereignty resides in the state, which possesses the power to regulate work, education, science, religion—indeed

every phase of the life of the people. The state claims supremacy in a moral as well as a legal sense; the individual has "rights" and civil liberties only in so far as the state confers them. A totalitarian state is generally governed by a *dictator*, who assumes supreme and unlimited power, no matter what type of government may nominally prevail (see Dictatorship). Hitler and Mussolini are dictators of a fascist totalitarianism in Italy and Germany (see Fascism). Stalin is dictator of a communist totalitarianism in Russia (see Communism).

Treason and Sedition

Treason is the most serious offense which a citizen can commit against the state. The third section of Article III of the United States Constitution defines treason against the United States as "levying war against them or giving aid and comfort to their enemies." Thus treason in wartime includes any act by a citizen which furthers the hostile designs of the enemy. In time of peace it may be considered treason to attempt to overthrow the government by force or to put up organized resistance against the execution of any law. A citizen who is convicted of treason may be punished by death, or imprisonment and fine. Sedition in modern times is applied to language or conduct which disturbs public order and the tranquility of the state. It differs from treason in that it is not accompanied by any overt act against the state. (For further study, see Reference-Outline following article Political Science.)

GRAIN ELEVATORS. When a farmer of the Middle West of the United States wishes to market his grain, he loads it on a truck or wagon and takes it to a grain warehouse called a country elevator. He may either sell his crop to the owner or manager of the elevator, or he may store it for future sale.

From the country elevators the grain is shipped to the large elevators at the central markets. There it is stored until time for shipment to mills or foreign markets. These terminal elevators are towering steel and concrete structures, some of which can store more than ten million bushels in their many enormous bins. An endless chain of buckets draws the grain from freight cars or boats to a hopper at the top of the elevator. Then the grain is dried, weighed, and bleached. To lessen the danger of dust explosions, the dust is removed by suction pumps.

The rapid expansion of wheat growing in the United States after the Civil War and the lack of facilities for storage caused the railroads to build country elevators or help private concerns to build them. They are owned by independent dealers, railroads, milling companies, or by coöperative associations. Canada has many elevators, but most other grain-exporting countries still store and ship grain in sacks, though this method is subject to considerable losses by vermin and fire.

GRAMMAR. Words are the most important tools by which we think and communicate our ideas to others. Grammar is the body of rules which tell us how to use

these tools correctly. In most thinking, writing, and speaking, we put words together into groups called "sentences" (see Sentence).

The sentence is a group of words expressing a complete thought. *A dog* is not a sentence, but *A dog bites* is. *Old King Cole* is not a sentence, but *Old King Cole was a merry old soul* is.

In written or printed English, sentences can readily be recognized, because each begins with a capital letter and ends with a period (.), an interrogation point (?), or an exclamation point (!) (see Punctuation). Failure to use these marks correctly makes it hard for one to understand what the writer is trying to say. For example, take these lines from a school-boy's composition:

"I got my first pair of skates on my seventh birthday they were more fun than anything else I ever had. It began to thaw the day before my birthday. so that I had to wait nearly a week for the river to freeze again before I could try them."

The boy who wrote this was not careful to show where one sentence ended and the next began. The first complete statement ends with the word *birthday*, and so he should have put a period after that word and started *they* with a capital letter. He was right in putting a period after *had* and starting the next word with a capital, because the second complete statement ended with *had*; but the next complete statement runs all the way to the end of the paragraph, and so the writer was wrong in putting a period after *birthday*.

Sometimes sentences have what seem like two or more sentences in each, but they are not *exactly* sentences, and so they are called *clauses*. For instance I may say: *I am sick. I ate ice cream.* But it would perhaps be more nearly true to say: *I am sick because I ate ice cream.* Here the two clauses are joined by the word *because*.

The Words that Tie Sentences Together

These words that join sentences are called "conjunctions." It is interesting that they also join words and what are known as phrases. In the sentence, *Jack and Jill went up the hill*, the word *and* is a conjunction joining two other words. And in the sentence, *It is in the kitchen or under the table*, the conjunction *or* joins the two phrases, *in the kitchen* and *under the table*.

The most common conjunction is *and*. This word some people use too frequently, hitching all their ideas together. For instance:

"I awakened early and dressed and found the bait and went fishing and caught eight pickerel and I came home and gave them to mother and she asked me to clean them and she fried them for us and they certainly tasted fine."

This looks like one sentence; but it is not really one, for it would sound much better to break up this long statement and say:

"I awakened and after I had dressed I found the bait and went fishing. I caught eight pickerel.

After a while I came home and gave them to mother, who asked me to clean them. Then she fried them for us. They certainly tasted fine."

If you have ever been in a museum you may have seen some of the earliest forms of the common tools which we use today. For instance, the oldest plow is a pointed stick with which the ground was dug up by sticking the point in and prying up the soil. Many improvements were made until we now have great gang plows hitched to tractors run by gasoline.

The same is true of the sentence. Long years ago the sentences we now use were single words. In fact, the first sentences of little children are still single words. A baby gets hungry and cries "Milk," or touches something and says "Hot." What you would say might be, "I want some milk," or "This oatmeal is hot." This is because you use the most improved form of sentences. However, just as it took a long time for people to learn to make our improved plows, so it took many thousands of years for people to work out the improved form of the sentence we now have.

The Essential Parts of the Sentence

But we still often use single words which have the force of sentences, though they cannot properly be called sentences. For instance, we say *Ouch! Fire!* or *Oh!* These are called "interjections." They are words that express strong feeling. Such expressions are not definite, because *Ouch!* may mean *I stubbed my toe* or *I hit my finger* or *Tom pinched me*. But they are handy expressions to use when we are in a hurry or are greatly excited about something. If I call *Fire!* people will come, even though they do not know exactly what is on fire or where the fire is.

Although people first used a single word for a sentence, and little children still do so, as soon as they wanted to be more definite they split the sentence into parts. Instead of saying "hurt!" the little child says "Finger hurts." He has then discovered the two parts to our sentence—"subject" and "predicate." The subject is the thing we talk about—*finger*, in this case, and the predicate indicates what is said about it—*hurts*, the baby says.

Now, all sentences can be divided into these two parts. No matter how long or complicated a sentence may be, this is true. In the sentence "The largest city of South America is Buenos Aires," the subject is not one word, but many. It is, *The largest city of South America*. The predicate is, *is Buenos Aires*.

Nouns that are Common and Nouns that are Not

In the sentence "Finger hurts," *finger* is the name of something, just as *city*, *South America*, and *Buenos Aires* are names of places. These name words are called "nouns." They may name some particular person or place, like *Charlie Chaplin*, *John*, *United States*, *Chicago*; or they may merely name a group or class of things, like *pen*, *dog*, *city*. You notice that most nouns begin with small letters but the names of persons and places begin with capital letters. The first of these classes we call "common nouns," and the second "proper nouns."

The Business of the Verbs

If we went about merely saying nouns to one another, we should not be able to make our meaning very clear. If a boy shouted "Baby" to his mother, she would probably think that the baby had fallen into a bucket of hot water, or out of bed. If the boy said "Baby" quietly, his mother would wait for the next word. She would want to know what the baby was doing or in what state or condition he was. If the boy said "Baby walks," the question in her mind would be answered by an "action" word *walks*. If he said "Baby is hungry," the question would be answered by an "existence" word *is*. Such a word doesn't show action; it merely links *baby* and *hungry*. The words which show action and those that link the subject to something said about it are "verbs." *Run, jump, play, eat, sleep, read, write* are all "action verbs." *Is, are, were, have been, will be*, are all "linking verbs."

The Little Substitutes for Nouns

A ten-year-old boy named James in talking to his mother would not say "James is hungry. James wants an apple." He would have noticed that people do not speak of themselves by name but use the words *I, me*, and the like. He would say "I am hungry. I want an apple." If he were a generous little boy he might say "John is hungry; *he* wants one too." The word *he* would stand for John. These substitute words are called "pronouns" because they are used for nouns; and the Latin word meaning "for" is *pro*. *I, he, you, they, them, me, we* are all pronouns.

Adjectives and the Art of Speech

So far we have talked about five of the eight kinds of words, or "parts of speech"—nouns, pronouns, verbs, conjunctions, and interjections. One can build many sentences with only these five kinds of words, but if there were no other parts of speech we should not be able to say many things that we should like to. For example, suppose you had lost a coat and were trying to tell about it so that people would know which coat you meant. If you said "Did you find a coat?" nobody could help you very much, in a large school especially, because perhaps other boys also had lost coats. But if you said, "I lost a *blue* coat," there would be more chance of your finding it. *Blue* adds to the meaning of coat—it describes it. You might have used *large*, or *old*, or *shabby*, or *new*, in place of, or with, *blue*. All these words that add to the meaning of nouns are called "adjectives."

How Adverbs Help the Verbs to Talk

If only one blue coat had turned up at the lost-and-found desk, you might not have much trouble in claiming your own. But suppose that four coats, and four blue coats, were awaiting their owners. You might have to tell other details to the man in charge, the *time* you lost the coat, the *place* in which you left it, or *why* you were so long about claiming it. You might say "I lost a blue coat yesterday in the basement." Then *yesterday* and *in the basement* would

tell time and place. They would make the verb *lost* more clear, and would add to its meaning. The coat found in that particular place (*in the basement*) and at the time (*yesterday*) would be identified as yours.

Such words or groups of words that narrow down or add to the meaning of verbs are called "adverbs" or "adverbial phrases." The word adverb is easy to remember because *ad* means "to" or "near." In the sentence "Very heavy clouds rolled quickly across the sky," you will discover a new way of using a helping word, if you look closely. We have had adverbs modifying or changing the meaning of verbs, but now we have a word modifying an adjective. The writer was not satisfied with saying that the clouds were heavy. He added the word *very* to make *heavy* more intense. *Very* is an adverb modifying an adjective. If the writer had wanted to make *quickly* more intense he might have said *very quickly* instead of *very heavy*. In that case the modifying adverb would have helped out the meaning of another adverb. Adverbs, then, may modify verbs, adjectives, or other adverbs. Just as adjectives themselves, they may be single words or groups of words.

How the Prepositions Help Out

In some of the little groups of words used so far, as *in the basement*, there are expressions which have not as yet been explained. In the sentence "I lost my coat in the basement," *in* is a new kind of word. It is a "relation" word; it shows a connection between *lost* and *basement*, but it doesn't mean anything alone. Such words are "prepositions." They show the relation between nouns or pronouns and some other word in the sentence. Thus in "The boy on the fence has a new bat," *on* is a preposition which shows the relation between *boy* and *fence*. These prepositions always have nouns or pronouns for objects.

Only Eight and You Know Them All!

Now you have learned the names of the eight parts of speech and something about each of them. You will be interested to know that all the hundreds of thousands of words in the dictionary belong to one or another of these eight classes. Everything that has ever been thought or written or spoken in the English language has been expressed by grouping together these parts of speech. Uneducated persons often have great difficulty in making others understand just what they want to say, because they do not know enough about words and sentences and how to use them. That is why it is important for you to learn "grammar," which is the study that tells you how to use these valuable tools.

You will find many other interesting and important facts about the parts of speech, and how to use them correctly, if you will turn to the articles in this work under the headings Adjective; Adverb; Conjunction; Noun; Preposition; Pronoun; Sentence; Verb.

How Grammar Helps You to Think

Grammar, as the science of language, has always had an important place in the schools. Three hundred years ago and for a long time after, grammar,

especially Latin grammar, held the first place. But with the growth of the common school system grammar dropped into the background. Even in the grades of the common school grammar holds a less important place than formerly. More thoughtful teachers omit formal grammar almost entirely in the first six grades, leaving it to the last year or two of the grammar school.

The general tendency of modern education is to make all studies more concrete and realistic; and, in agreement with this notion, geography, nature study, literature, history, and manual training have gained a more important place in schools, while grammar has lost.

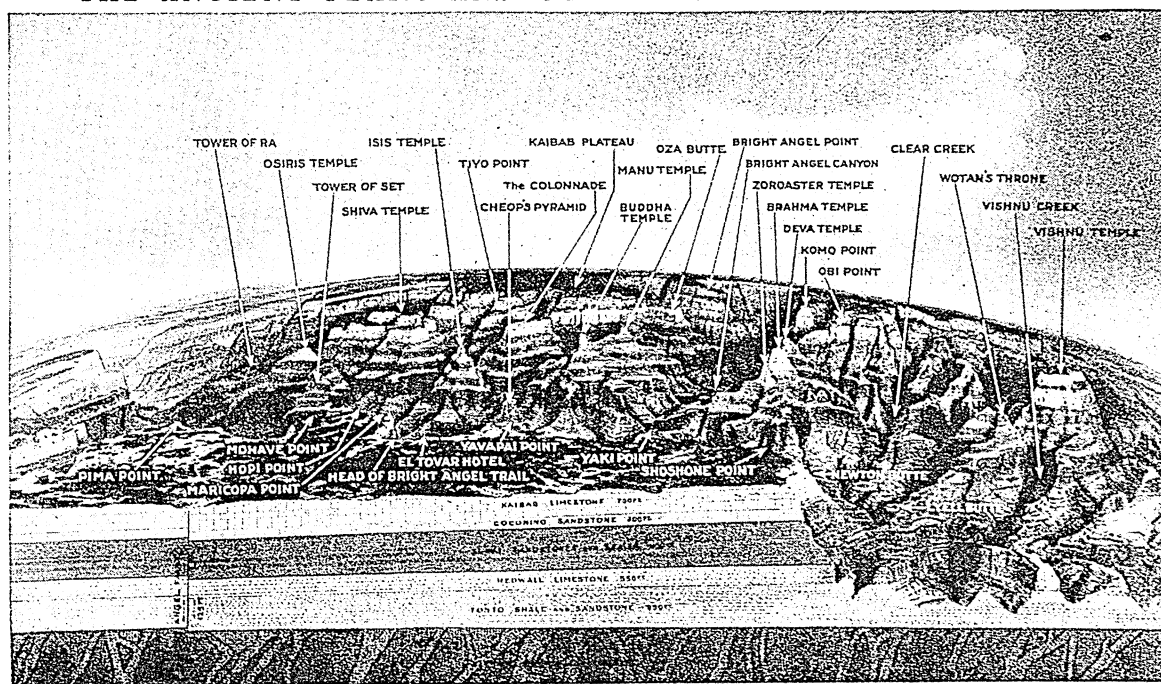
The real value of grammar may be stated thus: All human thought is expressed chiefly through language and, at bottom, the rules of correct thinking are involved in the study of grammar. Correct language is the popular form of logical thinking. To analyze sentences, to examine the structure and arrangement of the parts, to study the various modes of expressing thought and shades of thought grammatically—these activities have always been regarded as the most fundamental and universal method of disciplining the intellectual faculties. In this respect grammar contributes an element of logical accuracy to all studies and lays a basis for correct thinking. The study of grammar also teaches correct usage. Students of more mature years are greatly helped in correcting their faults by insight into the rules of grammar. They learn to criticise themselves and the wrong usages to which they have been accustomed.

The method of teaching grammar has been a subject of much controversy among educators. The older grammars were essentially deductive, proceeding from rules and principles to examples and further applications. Some of the later grammars have emphasized the inductive approach to the rules of grammar. In the inductive method the analysis of sentences is put first. Out of this study of sentences develop later the rules of syntax and the classifications of forms of speech and usages. Some of the more recent grammars have taught the subject in the way indicated above—as a *thought* study, an analysis of the processes of thinking rather than a formal treatment of words and sentences.

Students in the high school, employed in the study of German or French (or it may be Latin or Greek), are believed to receive a grammatical training superior to that given by the study of English. A chief argument for the study of Latin is, first, its linguistic disciplinary training, and second, its reflex influence upon English grammar and speech. Latin has had a great historical influence in determining the development of English speech. It has supplied many words and phrases and has shaped English speech through great writers who were fully saturated with Latin language and Latin style.

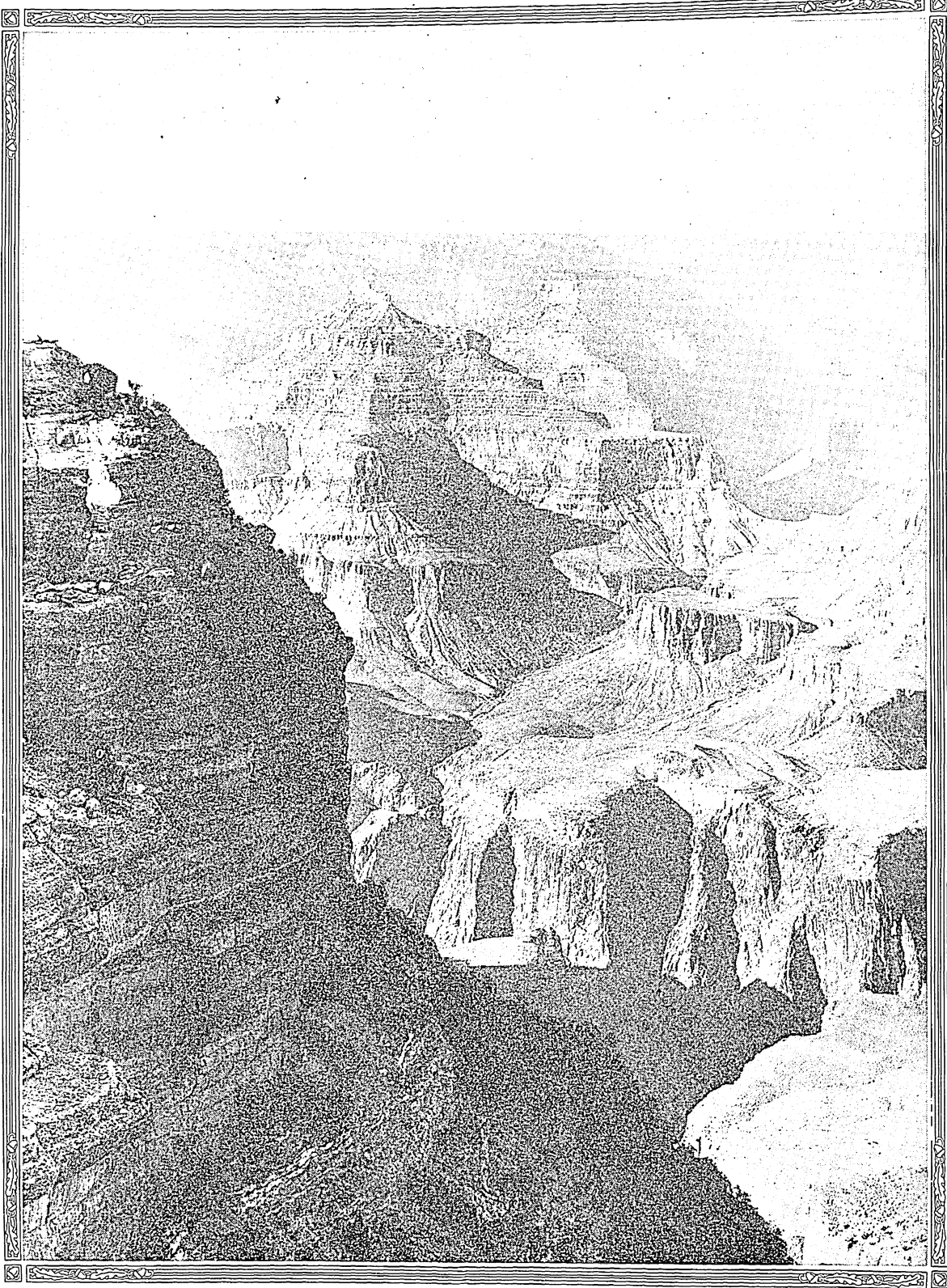
GRAND CANYON. When you stand on the rim of the 200-mile gorge cut by the Colorado River through the high plateau of northern Arizona, you are overwhelmed with awe. The Grand Canyon of the Colorado is the most spectacular canyon in the world. It is Nature's greatest example of sculpturing.

THE ANCIENT PEAKS AND GORGES OF THE GRAND CANYON



This greatly reduced model brings into one picture the striking array of Nature's sculptures which make up the marvelous show spot of the American Southwest.

THE STUPENDOUS CANYON THAT BAFFLES DESCRIPTION



So stupendous, so incredibly vast and magnificent, is the Grand Canyon, that, as one writer says, "It has swallowed all the words in the dictionary suitable for describing the impression it makes on the eye, and it still remains undescribed." Here we see how the tributaries of the Colorado have cut up the original mass into the "temples" and buttes. Some ledges are red, some yellow, some gray. Purples and blues and greens appear in certain lights. The effect is like a great broken rainbow.

Look across the yawning depths of the stupendous chasm to the opposite wall, ablaze with bands of glowing colors. Peer over the edge, and far below you see what appears to be a tiny silver thread; it is the swift-flowing Colorado, one of the large rivers of North America. It looks so small because it is a mile below you. At the top its canyon is 4 to 18 miles wide.

From the rim to the river's brink the walls descend in a succession of cliffs and terraces, like a giant's staircase, each step several hundred feet high. The barren rocks of white, buff, dull red, and green have been carved into a bewildering variety of forms—butes and pinnacles, alcoves and "Oriental temples" crowned by battlements.

The majesty of the Grand Canyon, which Charles Dudley Warner called "by far the most sublime of all earthly spectacles," is accentuated by a myriad of side gorges which join the main canyon from right and left. The region is "a composite of hundreds and thousands of gorges." Few have seen more than a tiny fraction of its wonders, for the journey through the length of the gorge is made extremely hazardous by the many rapids, in some of which the stream attains a velocity of 25 miles an hour. The first man to go through the canyon was Major J. W. Powell (1869), later Director of the United States Geological Survey, whose fascinating narrative of his explorations remains one of the classics of American travel.

Even the hardest frontiersmen shunned the unknown perils of engulfing whirlpools, underground passages, and giant falls which Indian legend attributed to the canyon, until Major Powell organized a party of ten to thread the gorge from end to end. Hazardous enough the adventure proved, though the underground channels and giant falls were found to be myths. On the very day the journey ended, just before Major Powell and the faithful few of his band emerged into safety, four men deserted, hoping to scale the walls, and were never heard from again.

A reservation of 1,008 square miles along the rim of the Grand Canyon was set aside by the United States government in 1919 as one of the national parks. In 1932 an additional 314½ square miles on the downstream side of the park were made a national monument. A railroad spur and motor highways reach the more accessible parts of the canyon.

GRAND RAPIDS, MICH. When an American thinks of furniture he thinks of Grand Rapids, "the furniture capital of the United States." About 60 furniture factories are located there, and the annual output is enormous. While New York and Chicago exceed Grand Rapids in the volume of production of furniture, Grand Rapids is regarded as the leader in design, finish, and quality.

Twice a year furniture buyers from all parts of the United States and even from abroad come to this city to inspect new styles and place orders. These events have become so important that manufacturers from other cities also send their products to be displayed in huge exposition buildings erected for their use.

Grand Rapids is the metropolis of western Michigan and the second city of the state in population and importance, both in number of wage earners and in value of manufactured products. It is built on both sides of the Grand River, about 35 miles from Lake Michigan, in the center of the famous Michigan fruit belt and of an attractive summer resort region filled with lakes. Although furniture making is its chief industry, Grand Rapids is not a one-industry town. It supplies the world with carpet sweepers and sticky fly paper, and manufactures automobile bodies and parts, theater, school, and church seats, brass and iron products, knit goods, flour, musical instruments, and folding paper boxes. Plaster and other gypsum products, made from deposits along the Grand River, are important.

The city, which has followed a definite plan of city building, is very attractive. The park and playgrounds system includes more than 200 acres.

In 1826 an Indian trading station was established on the site, and the first permanent settlement was made in 1844, by the Dexter Colony from Herkimer County, N.Y. Grand Rapids was incorporated as a village in 1838 and as a city in 1850. It adopted the commission manager plan of government in 1917. Population (1940 census), 164,292.

GRANITE. If you look closely at a piece of granite you will see that it is made up of more than one kind of material, and if you crush it to powder you can easily pick out tiny fragments of the separate substances, or minerals, that compose it. The chief minerals are quartz, feldspar, and mica. The color of granite depends on the proportions and varieties of the minerals present. The prevailing color is gray,—light gray if dark minerals are few, dark gray if they are abundant. Greenish, pink, and red hues are due to different kinds of feldspar.

Granite belongs to the group of "igneous" rocks—that is, it was formed ages ago by the cooling of liquid lava. This cooling took place far below the earth's surface and very slowly, thus giving plenty of time for the formation of crystals. Granite belongs to no particular geological age, but was formed in all periods and may be forming now far below the earth's crust. It is one of the most widely distributed of rocks, occurring in the United States mainly in mountainous regions.

Fresh granite is a very hard stone, but like other rocks it may decay and crumble to pieces. Because of its great hardness it is difficult to work, and so is an expensive building stone. It is used chiefly for paving blocks, for monuments, and for large buildings, where great strength and durability or beauty of finish are required. Many of the varieties are exceedingly beautiful in coloring and take a high polish.

New England supplies much of our granite, Vermont, Massachusetts, New Hampshire, and Maine being large producers. Other important quarries are in North Carolina, Georgia, South Carolina, Minnesota, Wisconsin, and California.

The HERO of APPOMATTOX, in WAR and in PEACE

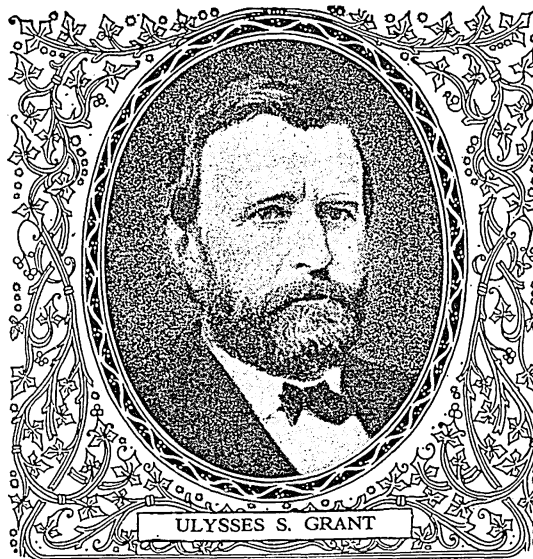
GRANT, GEN. ULYSSES S. (1822-1885). When the news that Fort Sumter had been fired on was flashed over the wires, in April 1861, meetings were held in every city and village in the North, and volunteers by thousands offered their services in defense of the Union, even before President Lincoln issued his first call for troops. At a meeting in Galena, Ill., a middle-aged clerk in the hardware and leather store of Jesse Grant came forward and offered to help recruit a regiment. This man was Ulysses S. Grant, a graduate of West Point, who had served with distinction in the Mexican War and had resigned from the regular army with the rank of captain.

Born on April 27, 1822, on a farm near Point Pleasant, Ohio, the boy was named Hiram Ulysses. An error in his papers when he entered West Point Military Academy in 1839 dropped the Hiram and inserted Simpson, his mother's maiden name. He reported the error, but it was never corrected, and eventually he adopted the name as changed. But his son, U. S. Grant, Jr., reports that the "S" was always written without a period, and that while it may have meant "Simpson," it was never so written.

Upon his graduation in 1843, Lieutenant Grant was sent to Jefferson Barracks, Mo., and thence to the Mexican War, where he won two brevets for bravery. In 1848 he married Julia B. Dent, the sister of a classmate, in St. Louis, and saw several years' service in the Far West in pioneer days. In 1854 he resigned and retired to a farm near St. Louis, later opening a real-estate office in the city. But in business Grant was a failure. He got into debt, and was glad to take a place as clerk in his father's store in Galena.

A Man of the Bull-Dog Breed

In May 1861, Grant was appointed colonel of the 21st Illinois Infantry, and in August he was made brigadier-general of volunteers and given command of southwestern Missouri, with headquarters at Cairo. From the start Grant's policy showed the aggressiveness which marked his whole career. He at once took possession of Paducah, Ky. On November 1 he routed the Confederate garrison at Belmont, Mo., a result which checked the advance of a Confederate force under General Price. In February 1862, he captured Fort Henry on the Tennessee and Fort Donelson on the Cumberland. While he was besieging the latter the commander of the fort, General Buckner, asked



for terms of capitulation, to which General Grant replied: "No terms other than an unconditional and immediate surrender can be accepted." Buckner surrendered the fort with over 14,000 prisoners, and Grant became famous as "Unconditional Surrender" Grant. This important victory broke the Confederate lines, and secured Federal control of western Kentucky and Tennessee.

Grant was now made major-general of volunteers and given command of western Tennessee. On April 6 he fought the battle of Shiloh, one of the bloodiest engagements of the war. He was severely blamed by the people of the North for the heavy loss of life in this battle, and many demanded his removal from command. But President Lincoln steadily upheld him, saying, "I can't spare this man, he fights." During the summer he fought the minor battles of Iuka and Corinth.

Then Came the Fall of Vicksburg

He then turned to the capture of Vicksburg, which would open the Mississippi River. His first advance on the city, poorly planned and complicated by political intrigues, proved a failure. But Grant remained in the neighborhood with his army, and after trying one plan after another without result, his perseverance was at length rewarded. After a daring campaign, in which his generalship and his energy were more conspicuous than ever, he besieged the city, and at the end of six weeks this stronghold, with its garrison of 32,000 men, was surrendered (July 4, 1863).

Grant's next campaign was for the relief of Chattanooga, where the Federal army, beaten at Chickamauga, was besieged and practically cut off from supplies. On November 23 to 25 the battles of Lookout Mountain and Missionary Ridge were fought, resulting in the defeat of the Confederates.

In March 1864 Grant was made lieutenant-general and placed in command of all the Union armies. He now planned a wide campaign which should press the Confederates simultaneously at all points east and west. Leaving Sherman to fight Johnston from Chattanooga to Atlanta, he himself with the Army of the Potomac confronted the Confederates under General Lee. The clash of these great leaders came in the terrible battles of the Wilderness, Spottsylvania, North Anna, and Cold Harbor. Finally came the siege of Petersburg, which ended in its fall, the capture of Richmond, and the surrender of Lee at Appomattox.

tox, April 9, 1865. Grant's generous terms of surrender and his courteous treatment of his late foe won the heart of the South. At a later time he even threatened to resign his command if President Johnson had Lee tried for treason.

The war was over. Grant went immediately to Washington to hasten the disbanding of the army. He was made a full general, the first to hold this rank in the United States Army, and was hailed as "the man of destiny" and "the nation's deliverer." As such, he was elected president in 1868 on the Republican ticket, with Schuyler Colfax of Indiana as vice-presidential candidate, against Gov. Horatio Seymour of New York, the Democratic candidate.

"The man on horseback" is not always a successful executive. General Grant's inexperience in civil administration was conceded and his lack of political ability was soon to be shown. But his strong will was known and also his rugged patriotism. He possessed the confidence of the people, and this was increased by the negotiation of the Washington treaty with England, which defined the rights and duties of neutral nations in time of war and arranged the arbitration of the *Alabama* claims. His attempts failed, however, to bring about the annexation of Santo Domingo to the United States.

The most important domestic problem of Grant's administration was the completion of the reconstruction of the South and the adoption of the 15th amendment.

In 1872 President Grant was overwhelmingly reelected, with Henry Wilson of Massachusetts as his running mate, in spite of the opposition candidacy of Horace Greeley, the noted editor of the New York *Tribune*, who ran on a Liberal Republican platform. At the beginning of his second administration Grant had to face the financial crisis of '73. Here he rendered an inestimable service to the country by vetoing a bill for issuing more "greenback" paper money, and by recommending that the government "resume specie payments" by redeeming its greenbacks in gold. The coinage bill passed the same year was later denounced as the "crime of 1873," because, by dropping the silver dollar from the list of standard silver coins, it "demonetized silver." His policy, however, was unquestionably in line with the best interests of the country.

The last years of Grant's presidency covered the lowest ebb ever reached in the political life of the country. High public officials allowed contractors to cheat the government out of millions of dollars, and themselves profited by the bribes given them. There were grave scandals connected with government aid to the Union Pacific Railway, and the phrases

"Credit Mobilier," "Whisky Ring," and "Star Route," became synonyms for dishonesty. But in all the political corruption and scandal, no one imputed personal dishonesty to the President. He was unfamiliar with the intricacies of business and finance. His fault lay only in trusting those who were unworthy of trust and in trying to protect his friends.

In 1877, after his retirement from the presidency, General Grant made his famous tour of the world, in which Occident and Orient competed to do him honor. The attempt to secure for Grant the Republican nomination in 1880 for a third term

failed in spite of strenuous efforts put forth by the "stalwart" Republicans.

At the age of 56, a man of established fame, Grant invested his capital in the banking firm of Grant and Ward, New York City. With his usual trust in his associates and his ignorance of business, General Grant left the conduct of the enterprise to his partners, who proved dishonest. Through their dishonesty the firm failed, and Grant was left penniless. A fall had crippled him, so that, at this time and until his death, he had to use a crutch.

Nothing in all the career of this great American is so heroic as the closing year of his life. Bankrupt, crippled, dying of cancer of the tongue, he dictated two volumes of 'Memoirs' to provide for his family. When it was absolute agony to speak, with a fortitude and unselfishness that have few parallels in history, he continued his task, completing the work only four days before his death, at Mt. McGregor, near Saratoga, N.Y., on July 23, 1885. Even as literature the 'Memoirs' have a singular merit, on account of their clear, straightforward style. The magnificent tomb erected to Grant's memory in Riverside Park, New York City, is the tribute of a grateful nation to the man to whom was chiefly due the military successes which preserved the Union.

GRAPEFRUIT. Did you ever wonder why a fruit as large as a croquet ball should be called a "grapefruit?" The answer is evident when you walk through

GRANT'S ADMINISTRATIONS

1869-1877

Treaty to annex Santo Domingo defeated (1869).

15th Amendment enfranchising Negroes ratified (1870).

Last of seceded states restored (1870).

'Alabama' Claims referred to arbitration (1871).

Amnesty Act for ex-Confederates passed (1872).

Great fires in Chicago (1871) and Boston (1872).

Panic of 1873.

Bill to increase paper money vetoed (1873).

"Salary Grab" raises Congressmen's salaries (1873).

Postal cards first issued (1873).

"Whisky Ring" scandal exposed (1874).

Custer Indian Massacre (1876).

Colorado admitted (1876).

Centennial Exposition at Philadelphia (1876).

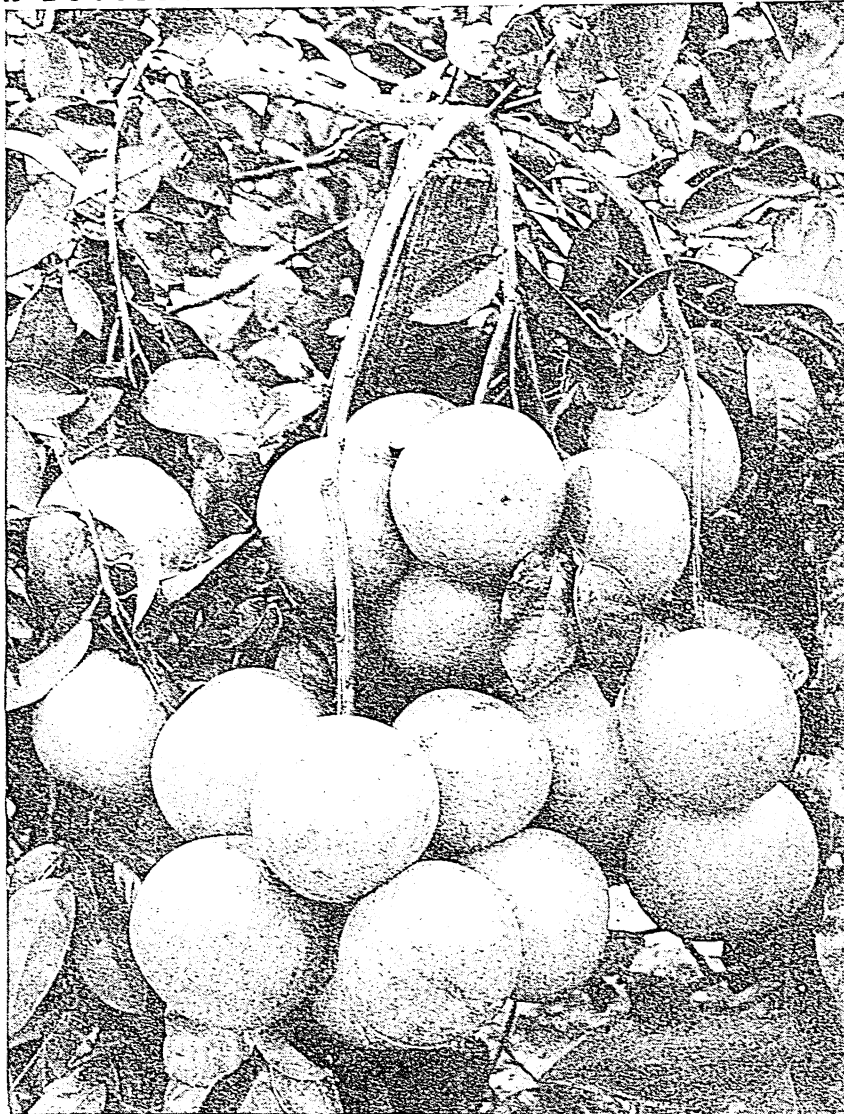
Disputed Election of 1876.

a grapefruit orchard in the southern parts of Florida or Texas or California during the bearing season. You will see the heavy fruit hanging in grapelike clusters of from three to 18, weighing down limbs and tree until they must be propped up.

The grapefruit belongs to the same species of the citrus family as the shaddock, a coarse bitter pear-

Spaniards along with the orange and lemon. The tree is very beautiful, with dark glossy leaves, downy white beneath, and large sweet-scented blossoms which are succeeded by the great clusters of lemon-yellow fruit. The tree was long cultivated in Florida gardens for show. Its fruit was considered refreshing and tonic, but it did not enter the minds of the growers

A LUSCIOUS CLUSTER OF GOLDEN GRAPEFRUIT



Isn't it strange that although this delicious fruit came to America with the Spaniards several centuries ago, we only began eating it in recent years? Meanwhile how many thousands of these golden globes rotted in the sun, because people didn't realize how good they were!

shaped fruit weighing from 10 to 20 pounds, which is a native of the Malay Archipelago and the South Sea Islands. The best varieties of grapefruit are about twice the size of a large orange.

The grapefruit (also called pomelo) has an interesting history. Only since the early part of the 20th century has it been marketed to any extent, although it was brought to the West Indies and Florida by the

that it had a commercial value. So the ground beneath the trees, after the fruit had ripened, was covered with the great juicy yellow balls, left to rot in the sun.

Northern visitors to Florida learned to like the grapefruit and wanted it on their return, and in this way a certain demand was created for it. Between 1880 and 1885 the first shipments were sent to New York and Philadelphia, and a market was established, at first slowly, then more rapidly.

Later, orchards were set out in California, though on a far smaller scale than in Florida. In the last few years the Rio Grande Valley of Texas and the Yuma region in Arizona have become famous for the quality of their grapefruit. The fruit is also cultivated in Cuba and Jamaica.

As a breakfast fruit grapefruit has no rival. It is an excellent appetizer and its characteristic flavor, which is an indescribable blending of sweet, sour, and bitter, is most pleasant. There are several varieties, the best known being Duncan, Marsh seedless, and Walters.

The tree is small, growing to a height of only about 25 feet, and is less susceptible than the orange to pests and diseases. It is more susceptible than oranges or lemons, however, to an infec-

tious disease called citrus canker. The infection causes scabs to appear on the leaves and fruit.

The grapefruit is usually budded on its own stock or on the sour orange. The tree is a heavy bearer and bears as early as the orange—in about six years—but it is more easily injured by cold, and is grown only in the southern parts of Florida, California, Texas, and Arizona. Scientific name, *Citrus decumana*.

The FRUIT of the VINE and Its STORY

*How All Our Purple Concords Came from a Single Seed—Why
the Famous French Vines Have American Roots—Grape
Seeds that Are 3,000 Years Old*

GRAPES. Until a little more than a hundred years ago, the only grapes grown in the eastern United States were the little sour wild grapes you so often see growing in the woods. All the delicious varieties of the eastern United States today, from the tiny reddish Delaware to the great yellow-white Scuppernong, have been developed by careful selection and cultivation from these wild grapes; and most of them have come from one kind—the fox grape.

Take the fascinating story of the rich purple Concord grape, for example. In the year 1840 some boys of Concord, Mass., spent a glorious day gathering wild grapes in the nearby woods. On their way home they threw some of the seeds on the land of Ephraim Bull. Mr. Bull preserved one of the seedlings that sprang up, and three years later when it fruited he planted its seeds. One of the second generation of plants proved much superior to the others, so he destroyed the rest and preserved this, which became the parent of the countless Concord grape-vines of the eastern United States—the kind that supplies us with most of our table grapes.

A story much like this is behind all the other luscious native grapes of the United States, which now include about 800 varieties. The first "truly American grape" was the small sweet reddish Catawba, which has remained one of the most highly prized varieties ever since its discovery near the Catawba River in North Carolina, in 1802. The fine-flavored Isabella and Delaware were also among the earliest native American varieties to be developed.

While the United States has more than two dozen kinds of wild grapes, nearly all the 1,500 varieties developed in the Old World, through thousands of years of cultivation, come from one parent stock. But if you visit the famous vineyards of France you will find that many of them consist of European vines grafted on the root

of some American vine. And thereby hangs another of the interesting stories connected with the work of grape culture.

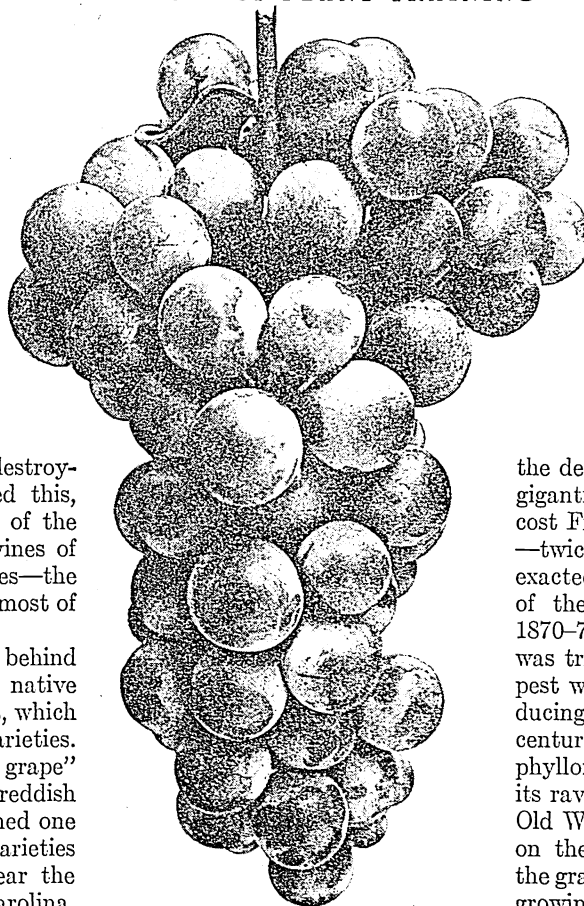
When the early settlers came to the eastern coast of America they brought with them cuttings from the grape-vines of Europe, but the plants all died. It was not until more than two centuries later that scientists discovered that this was due to the ravages of an insect pest, the grape phylloxera, which sucks

the sap from the roots of the vines (see Aphids). This insect multiplies with such terrific rapidity that a single mother, after laying her eggs in March, might have 25,000,000 descendants by October if they all survived. In 1860 some of these deadly pests were carried to France on American vines with which French growers were experimenting. In a few years the whole grape industry of France was threatened with destruction. By 1888

the devastations had reached such gigantic proportions that it had cost France two billions of dollars—twice as much as the indemnity exacted by Germany at the close of the Franco-Prussian War of 1870-71. Remedy after remedy was tried with little success. The pest was finally checked by introducing American vines, which centuries of exposure to the phylloxera have made immune to its ravages. The various famous Old World varieties were grafted on these American roots, so that the grape remains the same though growing on a different root. Similar measures have been adopted, though to a less extent, in nearly all the vine-growing countries of the world.

Even on the Pacific coast of the United States, where the phylloxera was formerly unknown, it has been necessary to replace many vineyards with European vines grafted on American stocks. In California, which produces about nine-tenths of the entire American crop, the common European grape has thrived ever since the days of

A MIRACLE OF PLANT TRAINING



No more striking example of the wonders of horticulture can be found than the development of such grapes as this from the little sour wild grapes of the woods. Under man's care, these fruits of the vine have grown sweet and swelled so in size that they crowd one another on their stem.

the Spanish missions, and from it many delicious varieties have been developed. Among these are the Alexandria (Muscat of Alexandria), Sultanina (Thompson Seedless), Flame Tokay, Emperor, Black Hamburg, and Cornichon. In New York, Michigan, Ohio, Pennsylvania, Arkansas, Missouri, Illinois, and other states, most vineyards grow grapes of the American euveitis type. This is derived mainly from the northern fox grape, and it includes such varieties as the Concord, Delaware, and Catawba. The Atlantic and Gulf coasts of the South are the native home of the muscadines, a type developed from the southern fox grape. Chief varieties are the Scuppernong and the Mish. The distinctive colors of grapes are in the outer skin. They range from pale green or yellow through red and purple to black, or even variegated.

Grape culture is one of the oldest arts practised by man. Grape-seeds have been found with mummies in Egyptian tombs at least 3,000 years old. Vines may be grown in many soils and climates, but they prefer sandy loams and warm, sunny locations. They are rarely grown from seed. A common method of propagation is to plant cuttings (sections of branches) from mature vines. Another method is *layering*. This is done by bending down a lower branch of a mature vine and forcing the branch to grow along a shallow trench in the ground. After shoots have started to grow upward from the buds or eyes of the branch, the trench is filled in with earth. The shoots then develop roots, and by fall or winter they are ready to be cut, roots and all, from the parent branch and to be planted next spring as new vines. Grapes are sometimes propagated by grafting cuttings on rootstocks of vines. As the vines develop, they are pruned regularly to insure a high quality and quantity of fruit; to free them of diseased branches, such as those afflicted with black rot; and to train the vines on upright stakes and then on trellises. In California, many vines are trained only on stakes. Thus the vineyards are free of trellises and can be cultivated crosswise as well as lengthwise. Vines repay good care, some remaining fruitful 300 or 400 years.

Grapes are so useful, and hence in such wide demand, that the annual crop in the United States alone totals billions of pounds, valued at many millions of dollars. The fruit is used largely in making wine and for raisins

(see Raisins). Wine is made by fermenting the juice of the grape. During fermentation, a grayish or reddish crust forms in the vat. This crust is a crystalline substance called *argol*, which when refined becomes the cream of tartar used in medicine and in baking powders. Grapes are prized also for their unfermented juice; for making jams, jellies, and butters; for canning; and for table use.

Dietitians esteem the grape because it is rich in sugar and is a source of vitamin B (see Vitamins) and of iron. (See also Currants.)

The European grape, which is believed to have originated in Asia, bears the scientific name *Vitis vinifera*. The fox grape, which is native to North America, is divided into two main species: *Vitis labrusca* (northern fox grape), and *Vitis rotundifolia* (southern fox grape).

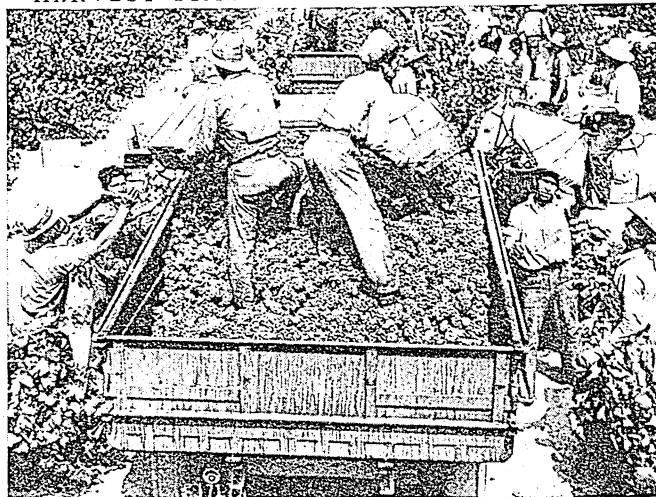
GRAPHITE. When you make a mark with the "lead" of a pencil, you are rubbing on paper tiny crystals of graphite.

This soft, slippery mineral (also called "black lead" and "plumbago") is an allotropic form of carbon (see Carbon; Pencils). Graphite makes an excellent lubricant, because its multitude of crystals readily adhere to rough metal to produce a smooth surface and to reduce friction. The chief use of graphite, however, is in foundries, where it gives a smooth facing (lining) to sand molds in which metal castings are made. Much is used also for crucibles, because it withstands terrific heat; and for electrotyping and electrical apparatus, because it is a good conductor of electricity. Other important uses are in paints, especially protective paints for structural ironwork, and in stove polish.

Graphite of high purity is artificially prepared from anthracite waste in electric furnaces at Niagara Falls, N. Y. Artificial graphite is also made in Canada and other foreign countries. Most of the world supply of mined graphite has long come from Korea (Chosen), Ceylon, Madagascar, and the Austrian, Bavarian, Bohemian, and Moravian sections of Germany. In some recent years, however, Russia has led in production. Italy and Mexico also produce important quantities.

The United States has much graphite, but mines relatively little because the deposits are of low grade. Colorado, Michigan, Nevada, and Rhode Island have "amorphous" or soft graphite; crystalline graphite occurs in Alabama, Alaska, California, New York, Pennsylvania, and Texas. The United States imports more than it produces of both natural forms, chiefly from Ceylon, Madagascar, Mexico, and Chosen.

HARVEST TIME IN A CALIFORNIA VINEYARD



Millions of tons of grapes, amounting to four-fifths or more of the total United States crop, are grown on ranches like this in California. Beverage grapes are dumped into trucks to be carried to the crushing plants, but table grapes must be carefully packed bunch by bunch.

HOW to MAKE FIGURES TALK

GRAPHS AND STATISTICS. If you were the manager of a baseball team, one of the important things you would need to know would be the batting average of your team. You would want to compare this average with the batting averages of other teams in your league. You would also study the batting averages of the different players on your team, to arrange the batting order and to consider replacing weak batters.

In the first instance your facts would be true in general for a group, the team, but not necessarily true for any one player. That is, the batting average of the team might be .275; but this might not be the average of any one player. In the second instance your facts would be true in general for each single player, but not necessarily true for any player at any specific time. In other words, a player's average may be .333; but this does not mean that he will make one hit and one only in every three times at bat.

Such general numerical facts are called *statistics*. They apply to a group, but not necessarily to any individual in the group; or they apply in general to an individual, but not necessarily to that individual in any one instance. The science of collecting, classifying, tabulating, and analyzing statistical data is also known as statistics. The word comes from the Latin *status*, meaning position or condition.

Almost everyone today is interested in statistics. In newspapers and magazines you find many statistical graphs, and statements based upon statistical data. Manufacturers, merchants, bankers, engineers, and physicians use statistical data in solving many of their problems. The businessman bases many decisions upon statistical information about his own business and about general conditions. Every civilized government regularly collects and distributes statistics about its citizens and the country at large. Without such information, no government could make sound plans for the future.

Students of the natural sciences, such as biology and chemistry, and of the social sciences—economics, sociology, education, and the like—use statistical methods in their researches. Teachers use them to judge the relative abilities and achievements of pupils. The pupils, too, find statistics useful in any number of ways in their studies and sports.

Collecting Statistical Data

The members of a social science class, for example, were talking about the changes which the automobile

has made in our way of living. They tried to estimate the recent increase in the number of cars; but, having no figures, they could not agree. A girl who had recently been in Europe said the United States had many more cars than Europe, but she could not say precisely what "a great many more" meant. Everyone said the car market fell off during the depression, and that this had caused considerable unemployment. But no one knew how much, or whether production had come back to the 1929 level. Finally a student got from the 'World Almanac' for 1938 the figures in Table I.

Rounding Numbers

It is not easy to keep in mind figures written out exactly to seven or eight places, and so, for quick comparison, Table II was drawn up by rounding each number in Table I to the nearest million. Since the number 9,231,941 is nearer to 9,000,000 than it is to 10,000,000, its approximate value was considered to be 9,000,000. The zeros were omitted because the

words "to the nearest million" in the column heading explain that the number 9 means "approximately 9 million."

Notice that for the year 1925 the rounded number for the United States registrations is 20 millions, and for the registrations in the rest of the world, 5 millions. But when the actual numbers are added, they come to 24,475,247, which rounds, not to 25 million, but to 24 million. Such discrepancies may occur in working with approximate numbers, but usually they are not serious.

Distributing the Data

The first thing we must do after collecting statistical data is to arrange them systematically, so that we can

analyze them. This is called "distributing the data"; and the arrangement of figures which we obtain is called a *distribution* or a *series*. One method of distributing data is in tables, such as those we have been considering. Most persons, however, can more easily grasp and retain the facts, changes, and comparisons which appear from statistics if the facts are presented in the form of pictures or diagrams, called *statistical graphs*.

Such graphs take several different forms. It would be interesting for you to watch for graphs in newspapers and magazines, and to see how many different kinds you can find. One of the easiest kinds to read is the pictorial graph, or *pictograph*, in which the figures are represented by pictures or symbols. The teacher therefore suggested that the class make a series of

TABLE I
REGISTRATIONS OF AUTOMOBILES
Exact Figures from 'World Almanac'

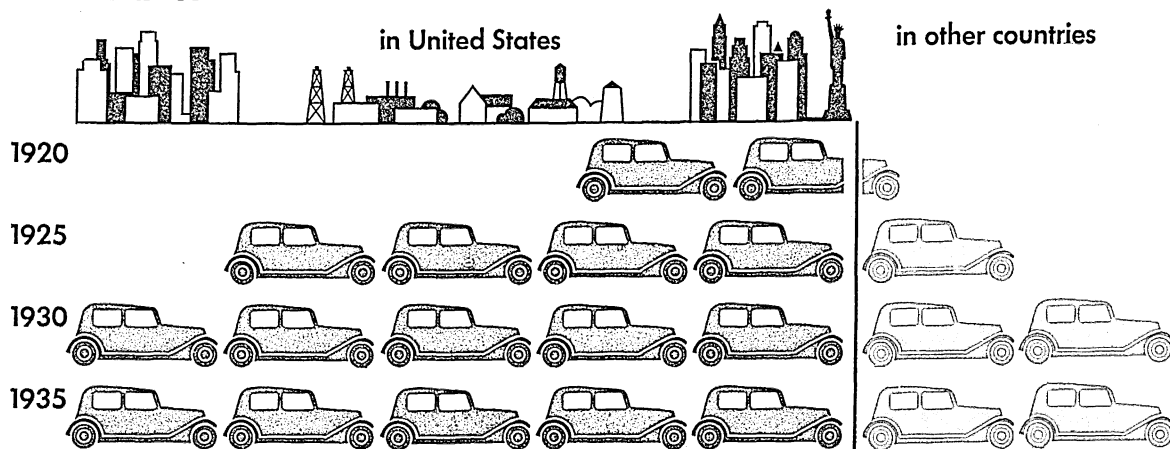
Year	Number of Registrations		
	United States	Rest of World	Entire World
1920	9,231,941	1,710,983	10,942,924
1925	19,937,274	4,537,913	24,475,247
1930	26,545,281	9,108,234	35,653,515
1935	26,230,834	11,072,488	37,303,322

TABLE II
REGISTRATIONS OF AUTOMOBILES
Rounded Numbers

Year	Number of Registrations to Nearest Million		
	United States	Rest of World	Entire World
1920	9	2	11
1925	20	5	24
1930	27	9	36
1935	26	11	37

Automobiles

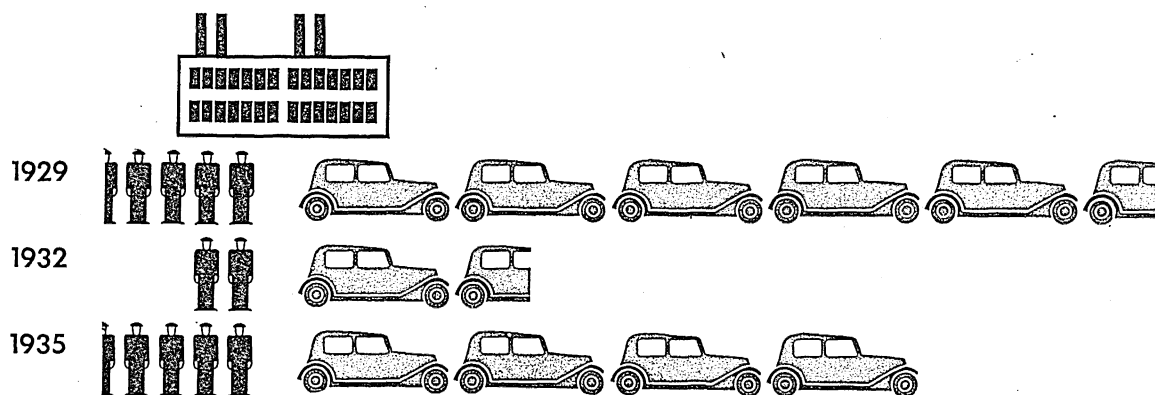
PICTOGRAPH 1



Each complete symbol represents 5 million automobiles

Automobile Production in the United States

PICTOGRAPH 2



Each complete man symbol represents 100,000 employed

Each complete car symbol represents 1 million cars produced

pictographs to show the trends in the production and use of automobiles.

Making Pictographs

They first made Pictograph 1, which presents the data in Table II. It did not seem practicable to let one symbol represent one million registrations, because too many symbols would be needed to show such world totals as 36 million and 37 million. They therefore decided to let one symbol represent 5 million registered automobiles (including trucks). The next step, then, was to round off the totals in Table II to multiples of 5. Thus 11 became 10 (two symbols), 24 became 25 (five symbols), and so on.

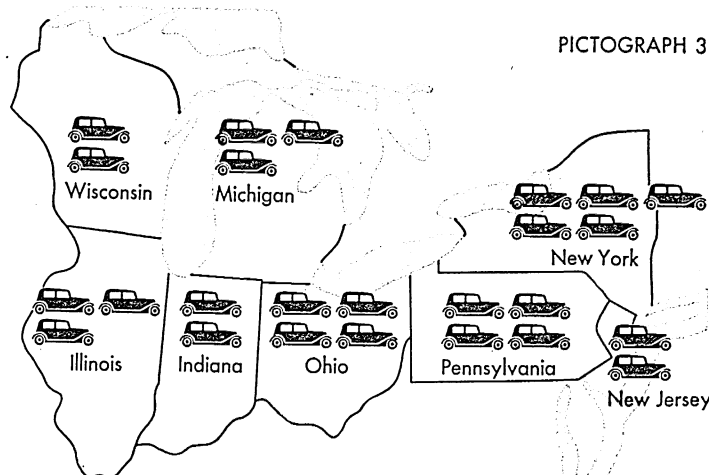
A comparison of Table II and Pictograph 1 brings out an interesting fact. From the pictograph it would appear that there was no change in the number of registered automobiles from 1930 to 1935. The table, however, shows that the number in the United States declined slightly, while in the rest of the world an increase of more than 20% occurred. This increase was

not enough, however, to call for an additional symbol. Thus these pictographs, while they vividly and interestingly depict large general trends, are not precise. For the exact presentation of numerical data, other forms of graphs must be used.

After obtaining additional data, the class made Pictograph 2, showing the effect of the world depression on automobile production in the United States and on employment in the industry. The pictograph brought up an interesting problem. If 450,000 men could produce five and a half million cars in 1929, why did it take 200,000 men to produce a million and a half cars in 1932? This, the class learned, resulted from putting men on part time to keep as many as possible employed. And this plan resulted in bringing employment in 1935 back to the 1929 level, even though a million and a half fewer cars were produced.

Notice that the scale for automobiles in Pictograph 2 differs from that used for Pictograph 1. Here a single car symbol stands for one million cars produced.

Automobiles in Certain States in 1930



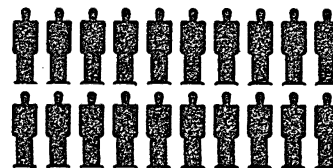
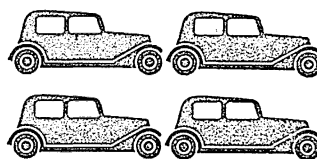
Each symbol represents 500,000 automobiles

The pictographs, or pictorial charts, that appear in this article and elsewhere in this encyclopedia are the work of the International Foundation for Visual Education, with headquarters at The Hague. This method of dramatizing statistical facts was developed by the distinguished Viennese sociologist, Dr. Otto Neurath, who is director of the Foundation. Most children and many adults find it hard to get meaning out of columns of figures or conventional graphs. These lively and colorful pictographs present number facts in a form which is easy to grasp, attractive, and stimulating.

Automobiles and Population in 1930

PICTOGRAPH 4

Pennsylvania



Michigan



Each car symbol represents 500,000 automobiles

Each man symbol represents 500,000 people

Prepared for Compton's Pictured Encyclopedia
© International Foundation for Visual Education

Every pictograph should include a clear statement of the values its symbols represent. This statement is called a *legend*. It should be read before studying the chart.

The class next made Pictograph 3, indicating the total number of automobiles registered in each of several states in 1930. It shows that Pennsylvania then had about twice as many cars as Wisconsin and about a third more than Michigan. It does not, however, show any facts about population. A student suggested that it would be interesting to find out how the number of cars in some of these states compared with the number of people, or, in other words, what proportion of the population in each state owned cars in 1930.

The investigation resulted in Pictographs 4 and 5. Pictograph 5 on the following page shows the population of each state included in Pictograph 3. Pennsylvania and Michigan were selected as the states to be used for the comparison shown in Pictograph 4. This pictograph shows that Michigan has about 3 cars to

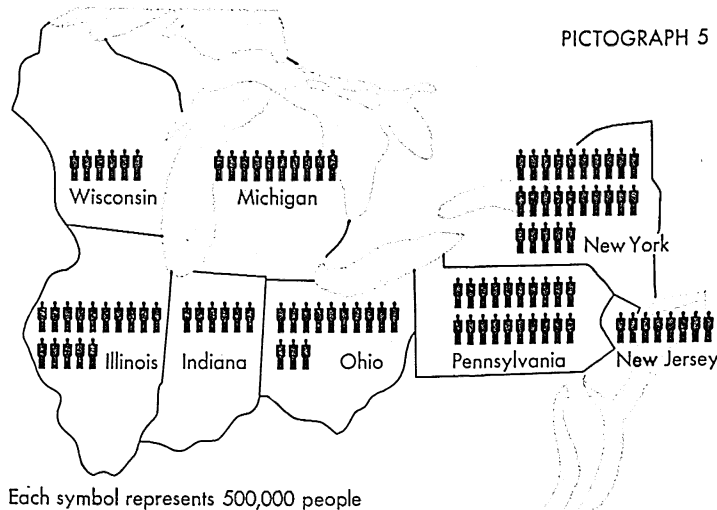
every 10 persons, while Pennsylvania has only about 2 cars to 10 persons. A comparison of the number of cars in relation to the population tells us that Pennsylvania has *relatively* fewer cars than Michigan, though *absolutely* it has more.

How Statistics Help to Explain Our Ways of Living

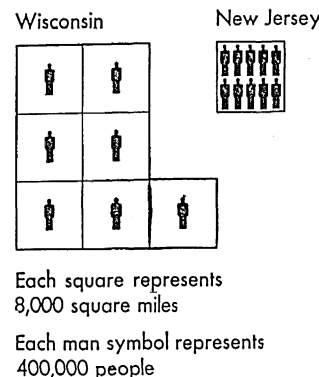
Important facts about the general conditions under which people live and work are revealed by such statistical measures as the number of automobiles per person, the average annual income for a particular profession, the average daily attendance for a school, the average density of population in a given area, the amount spent per pupil for education in a community. All public-minded persons are interested in facts like these. If we think such statistical statements are dull, it is probably because we do not understand how clearly they describe some aspect of the world we live in. Statistics about population, for example, show important changes that are coming in the United States (see Population). If we are aware of these impending

Population of Certain States in 1930

PICTOGRAPH 6



Density of Population



changes, we can be ready to help make the necessary adjustments in our laws and other institutions.

Simple graphs make such information easy to grasp and to remember. The phrase "average density of population" may sound uninteresting. But look at Pictograph 6. This shows that New Jersey has 4,000,000 people crowded into 8,000 square miles; that is, New Jersey has about 500 people to the square mile, or a population density of 500. Consider the contrast which Wisconsin offers. It has only about 400,000 people to 8,000 square miles, or 50 people to the square mile—one-tenth as many as New Jersey. Should we then expect to find thousands of large farms in New Jersey? Should we find it surprising that little New Jersey has six cities of more than a hundred thousand population each, while Wisconsin, seven times its size, has only one? The pictograph presents the situation vividly, though the numerical facts are only approxi-

mate. Wisconsin's 56,066 square miles has been rounded to 56,000; its population of 2,939,006, to 2,800,000. New Jersey's area of 8,224 square miles has been rounded to 8,000 and its population of 4,041,334 to 4,000,000.

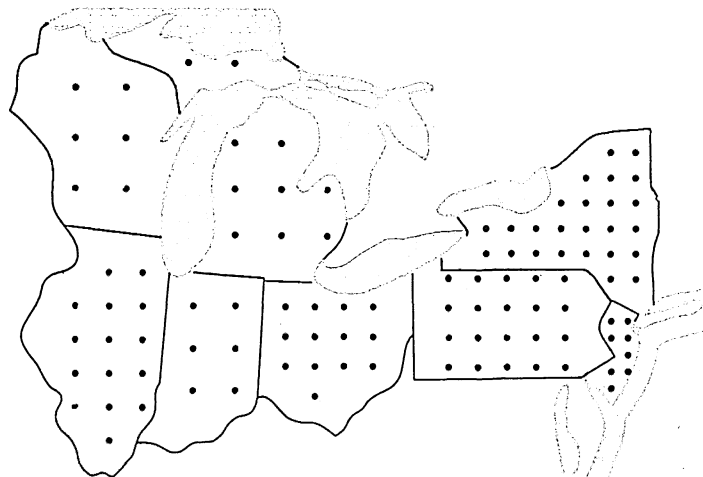
If Wisconsin's people were distributed evenly over the state, there would be about 52 of them on every square mile. In fact, of course, they are not distributed evenly. In the north some areas have only a few persons to the square mile, while around the larger cities there may be hundreds. To say, therefore, that Wisconsin has a population density of 52 persons to the square mile does not necessarily describe any single selected area, but it is an important general statement about the state. (You can find figures for your own state in this encyclopedia.)

Graphs 1 and 2 are similar to Pictographs 5 and 6, but the population figures are represented by dots

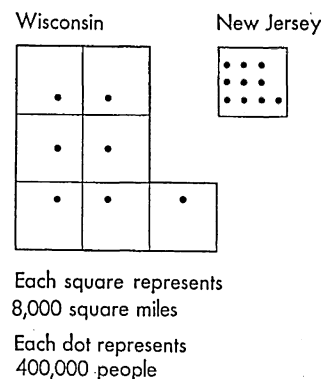
Population of Certain States in 1930

GRAPH 1

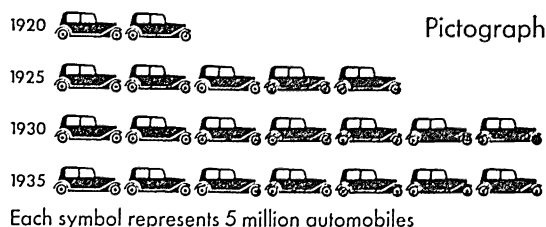
GRAPH 2



Density of Population



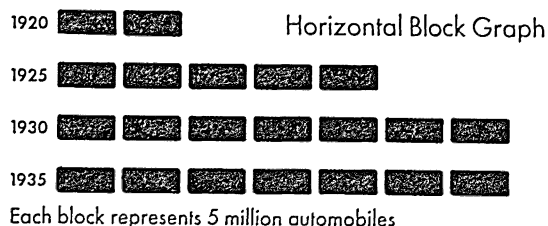
instead of by man symbols. Such dot graphs are read exactly like pictographs. The essential difference between the two types is that the symbols in the pictograph tell you at a glance whether it refers to automobiles or men or some other subject, whereas in a



dot graph you have to depend on the title and legend for this information. Figures can be represented more precisely in a dot graph, because it is possible to use a larger number of dots than of symbols.

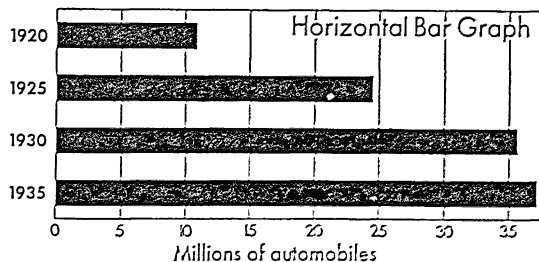
Bar and Line Graphs

Bar graphs and *line graphs* have certain advantages over pictographs, although they are not so attractive and are often more difficult to read. The illustrations on this page show the relationship between these three graphic forms. Each graph represents the same



data; namely, the figures in the last column of Table I. In the horizontal block graph, a small rectangle has been used instead of the car. This chart has the advantages neither of the pictograph nor of the bar chart, and is included here only to show the transition between them.

In a horizontal or a vertical bar graph, the lengths of the bars are in proportion to the numbers they represent. In a pictograph you count symbols to get



the numbers. In a bar graph you read the numbers from a scale parallel to the bars. Usually light lines are drawn from this scale across the chart to make it easy to compare the length of a bar with the scale. Such background lines are called a *grid*. Numbers can

be presented more precisely on a bar chart than on a pictograph, because the bars can be made longer or shorter to correspond with the actual figures. For example, the bar chart shows a slight increase in automobile registrations from 1930 to 1935, but it is not possible to show so small a change on the pictograph.

When a graph is designed to show the relation of parts to a whole, a single bar divided into parts is often used. (A good example of this kind of bar graph may be found on page U-185 in this encyclopedia.)

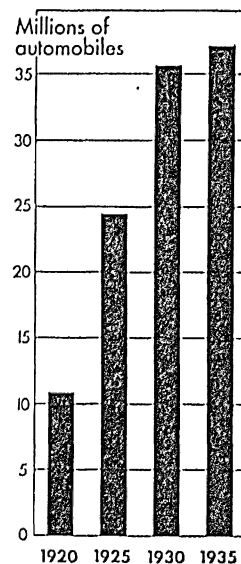
If the midpoint of the top of each bar in the vertical bar graph is connected by a line, we have the *line graph* shown in the figure below. The first point is placed above 1920 on the horizontal scale and opposite 11 on the vertical scale to indicate that 11 million automobiles were registered in 1920. Other points are found in similar fashion. Finding the points through which a line is to pass on a line graph is called *plotting the points*.

One great advantage of the line graph is that several different curves can be placed on one grid, and thus different sets of figures which are related can easily be compared. Another advantage is that a large number of points can be recorded accurately on one line. For example, it would have been relatively easy, by making this line graph slightly wider, to plot a point for every separate year from 1920 to 1935. But to make 16 rows of automobiles for a pictograph, or 16 bars for a bar chart, would be more difficult and would take up a great deal of space. The line graph, however, is not so easy for some people to remember, and does not attract attention so readily as either a pictograph or a bar chart.

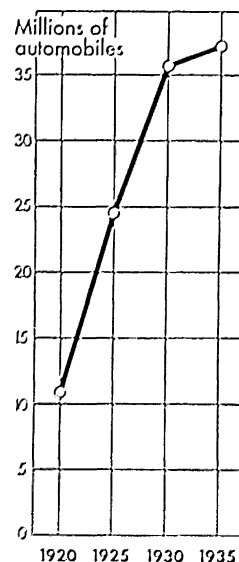
The Pie Chart

The *pie chart*, or *circle graph*, like the divided bar graph, is useful for showing the proportions into which something is divided. Graph 3 on the following page shows land use in the United States. Of the area of the United States, 21.7% is in

Vertical Bar Graph



Vertical Line Graph



crop land. Since there are 360° in the circumference of a circle, this proportion, laid off on the circumference, amounts to 78°. Pasture and grazing land accounts for 37.2% of the area, or 134°; woodland and forests account for 31.9%, or 115°. This leaves a remainder of 9.2% or 33°. This remainder includes mountains, lakes, cities, roads, and waste land. (Compare with the bar graph on page L-61b.)

Circle graphs of different sizes are not suited to showing a comparison of total areas, because it is hard for the reader to estimate correctly the relative areas of the circles. Rectangles are much more satisfactory for this purpose. In Pictograph 6, for example, it is easy to see that Wisconsin is about seven times as large as New Jersey. Comparisons of land uses in two countries or states are readily made by dividing rectangular graphs of their areas according to land use.

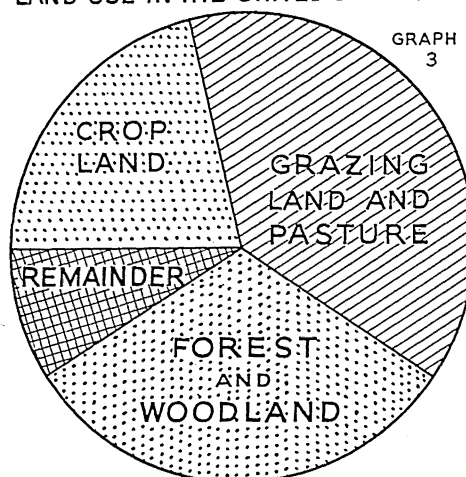
Frequency Distribution

Many investigations are conducted to determine averages, or to find the most typical or most frequently occurring numbers or sizes in a mass of figures. A convenient method of arranging data for such a study is to sort them into classes according to their size. Such an arrangement is called a *frequency distribution*.

A junior high-school civics class in a medium-sized city became interested in finding out how much it cost the taxpayers to give children a public-school education. They wrote to the Office of Education at Washington for information. In reply they received figures for 80 United States cities of from 30,000 to 99,000 population. The figures showed the average daily amount spent per pupil in each of these cities. The class decided to chart the figures for the 80 cities and see what conclusions they could reach about average school expense in communities like theirs.

Some members of the class felt that only cities of the same population as theirs should be included in their study. Looking over the figures, however, they found that some of these cities spent much more per pupil than others. The class decided, therefore, that a more representative and significant result would be obtained by using statis-

LAND USE IN THE UNITED STATES, 1930



SOURCE: NATIONAL RESOURCES COMMITTEE

GRAPH 3

tics for all 80 cities in the list.

The pupils found that the range of the amounts spent was from 16 cents to \$1.08. They divided these amounts into groups by rounding them off to the nearest 5 cents. The amounts from 13 to 17 cents inclusive were grouped under 15; from 18 to 22 cents inclusive, under 20; and so on. Such groups are called *class intervals*. The pupils then distributed the amounts according to the number of times each amount occurred. One pupil read the figures aloud while another tabulated them, setting down a tally opposite each number. Each fifth tally was

drawn diagonally across the four preceding ones. The result was the frequency distribution shown in Table III.

From this table they made a frequency chart (Graph 4) of the kind called a *histogram*. The height of each bar represents the number of tallies (cities) in each class interval. That is, in one city only is the daily expense per pupil nearer to 15 cents than to 10 cents or 20 cents; in two cities it is nearer to 20 cents than to 15 cents or 25 cents, and so on.

Central Tendency and Three Kinds of Averages

The next step in the study was to find which amount would come nearest to being a representative sum.

Someone suggested finding an average by adding together the amounts spent by all the 80 cities and dividing by 80. The sum of the amounts spent was found to be \$3,835. Dividing this number by 80 gave an average of 47.9 cents, or in round numbers 50 cents. This kind of average is called the *arithmetic* (pronounced *arith-met'ic*) mean. It is the most familiar sort of average, but for certain purposes other kinds of average are more useful.

A boy suggested that perhaps 40 cents was a more representative sum than 50 cents, because 13 of the cities spent an average of 40 cents per day—a larger number than appeared in any other class interval. This student had hit upon another average commonly used by statisticians. It is called the *mode*. "Mode" means fashion, and just as the most popular style of garment is the fashion, so the measure that occurs most frequently in a set of measurements is the mode.

TABLE III

TOTAL DAILY EXPENSE PER PUPIL
IN SCHOOLS OF 80 CITIES OF
FROM 30,000 TO 99,000 POPULATION

Cost in Cents (Class Intervals)	Number of Cities
15	I
20	II
25	III I
30	III
35	IIII
40	IIII II
45	IIII I
50	IIII
55	IIII
60	II
65	II
70	II
75	II
80	II
85	
90	
95	II
100	
105	
110	I

The teacher suggested still another kind of average that the class might take into consideration—the *median*. In a series of items arranged according to size, the median is the value of the middle item. If five 15-year-old boys weigh respectively

97 99 100 105 109

pounds, 100 pounds would be the median. If, however, you were considering the weights of six 15-year-old boys—an even number—who weigh

97 99 100 102 105 109

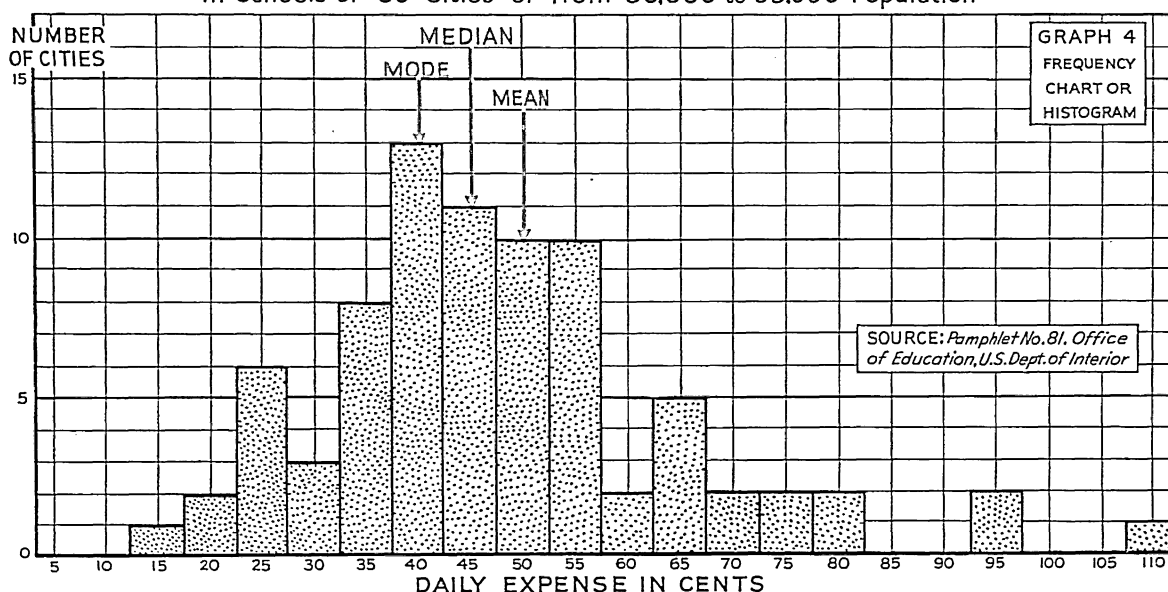
pounds, you would add 100 and 102 and divide by 2 to find the median—101 pounds.

In Graph 4 the median is approximately 45 cents. In this distribution 33 items lie below the 45-cent interval and 36 items lie above it. The median, there-

called *dispersion*, or *scatter*; and the amount of dispersion is often as important as the measurement of central tendency. The marksmanship charts in the article on Individual Differences provide an example.

Some of the methods used to measure dispersion require difficult computations. One easy measure is the *range*, or the difference between the smallest and the largest figures in the distribution (15 and 110 in Graph 4); but it gives only a rough measure. Quotations of interest rates and prices of securities usually give the range. The *quartile deviation* is a better measure. Quartiles divide the distribution into four equal parts, just as the median divides it into two equal parts. One-fourth of the items lie below the first quartile in value; three-fourths of them lie below

TOTAL DAILY EXPENSE PER PUPIL
In Schools of 80 Cities of from 30,000 to 99,000 Population



fore—the average values of items 40 and 41—lies in the 45-cent interval. The exact median (46.4) would have to be worked out by distributing the values of the 11 items in the 45-cent interval and then averaging the values of items 7 and 8 in that interval. But since the class was dealing only in round numbers, the value 45 was accepted as satisfactory.

All three of these averages—the mean, the mode, and the median—are called *measures of central tendency*. The class decided that for their purpose the median was a better average than the mean, because the average would be changed considerably if two or three cities with unusually high costs were dropped from the table, whereas this would not greatly affect the median.

Measures of Dispersion

In studying a frequency distribution it must be kept in mind that most of the items vary from the average; that is, their values are greater or less than any of the average values. This departure from average is

the third quartile. The difference between these quartiles is often used as a measure of scattering. *Deciles* divide the distribution into ten equal parts and *percentiles* into 100 equal parts.

Sampling

The 80 cities represented in the study amount to only about 35% of the United States cities of from 30,000 to 99,000 population. They constitute a *sample* of the cities falling within this class. It is often impractical or even impossible to get data for all the individual items in a group, and therefore many of the studies made by statisticians are based on samples. A true general picture of a large number of items may be obtained by sampling because there is in nature a uniformity in great numbers of things. It is important, of course, that care be taken to select samples that are representative of the whole from which they are taken. The results of sampling may be very misleading if the samples are biased. The 80 cities were selected from different regions, so that all regions

in the country were represented. In some studies the best results are obtained by *random sampling*—such as drawing slips from a hat.

The Ratio Chart

Almost everyone is interested in the growth of his community. Such growth might be described by a statement of *absolute* growth, such as "Our town has 600 more people than it had ten years ago," or by a statement of *relative* growth, such as, "Our town's population has increased 10% in the last ten years."

An important difference between stating increases in absolute amounts and stating them as *rates of change* may be made plain with a simple example. Suppose the population of a town of 6,000 increases 600 in ten years. The increase amounts to 10%. But if a town of 12,000 increases 600 in ten years, the increase is only 5%. To increase at the same rate as the town of 6,000 it would have to gain 1,200 in ten years. Thus the rate of change depends, not only upon the amount of the change, but also upon the *base amount*.

Graphs 5 and 6 show, respectively, the absolute and the relative growth of the largest five cities in the United States and two others for comparison. On each chart the horizontal scale represents time, marked off in ten-year periods. The vertical scale represents population, shown in thousands. On Graph 5, however, equal distances on the vertical scale represent equal differences in absolute population; for example, the distance from 500 to 1,000 is equal to the distance from 1,000 to 1,500. The scale is called an *arithmetic scale*. In Graph 6, on the other hand, equal distances on the vertical scale represent equal *percentage* differences, or rates of growth, and therefore unequal absolute differences.

For example, the absolute differences between 10 and 1, 100 and 10, and 1,000 and 100 are respectively 9, 90, and 900, but 10 has the same ratio to 1 that 100 has to 10—the ratio 10 to 1. Similarly, 6 and 5, and 60 and 50 have the same ratio, 6 to 5; and this is smaller than the ratio between 5 and 4 or 50 and 40, which is 5 to 4. Hence if the ratios of the numbers between 1 and 10 are drawn up on a scale, the same scale will hold true for the ratios between 10 and 100, between 100 and 1,000, and so on. Thus 1 and 10 and 10 and 100 will be equal distances apart. Such a scale is called a *logarithmic scale*, because it shows numbers according to their logarithms (see Powers and Roots; also Logarithm in the Fact-Index). *Ratio*, or *rate of change*, charts are called *logarithmic* charts if both scales are logarithmic. Graph 6 is *semi-logarithmic*

because its vertical scale is logarithmic and its horizontal scale is arithmetic. If you have studied logarithms you will understand why the scale on such a chart begins at 1 and not at 0.

Look at Graph 5. It shows that New York and Chicago have grown rapidly since 1860. Philadelphia and San Francisco have grown steadily, but more slowly. Detroit and Los Angeles grew slowly at first, then rapidly. San Diego seems to have grown only slightly. But look now at Graph 6. On a ratio chart a line is

straight if the rate of change is constant from year to year. The steeper the slope of a line, the more rapid is the change it represents. If two cities are growing at the same rate their

growth will be represented by parallel lines, even if one city is much larger than the other. Thus we see in Graph 6 that New York and Philadelphia have been growing at almost the same rates, but that Philadelphia's growth has been a little slower. We see that in the decade from 1860 to 1870 San Francisco grew very rapidly. But its rate fell off later, and since 1880 it has grown at very nearly the same rate as Philadelphia. And we see that San Diego grew as fast as Los Angeles most of the time. Not many persons would have realized these facts from Graph 5, but Graph 6 brings them out sharply.

Let us see by what ratio the population of New York increased during the period studied. Lay the edge of a plain piece of paper along the vertical scale and mark the points representing the population in 1860 and 1930. Then place the lower mark at the bottom of the scale. The upper mark will be about opposite the first line above 5. This means that the population in 1930 was about six times as large as the population in 1860. You can verify this from the actual figures by dividing 1,175 into 6,930.

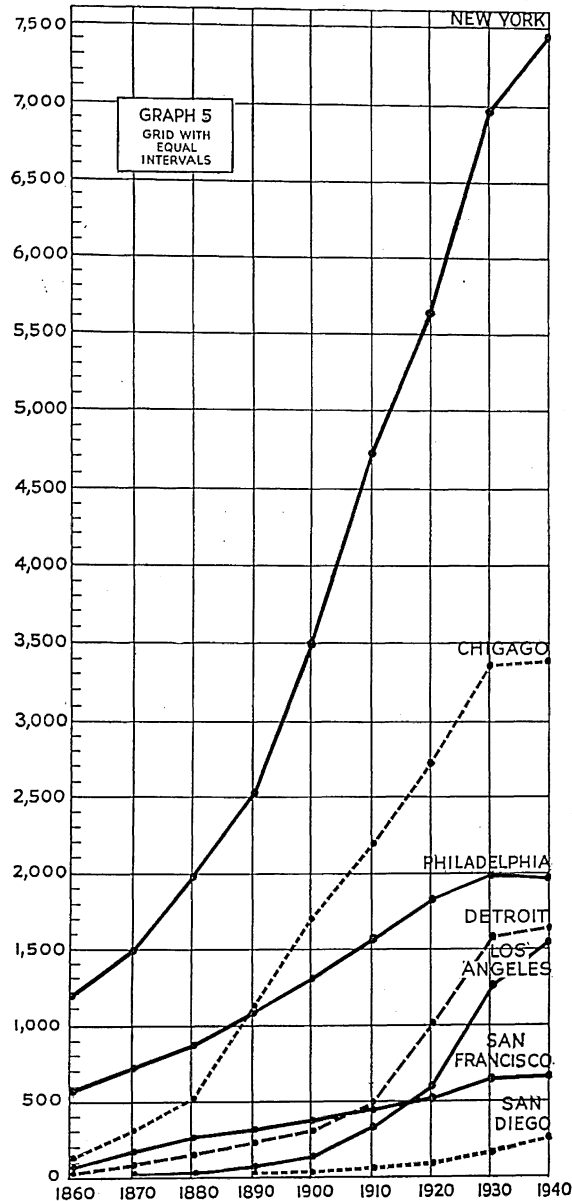
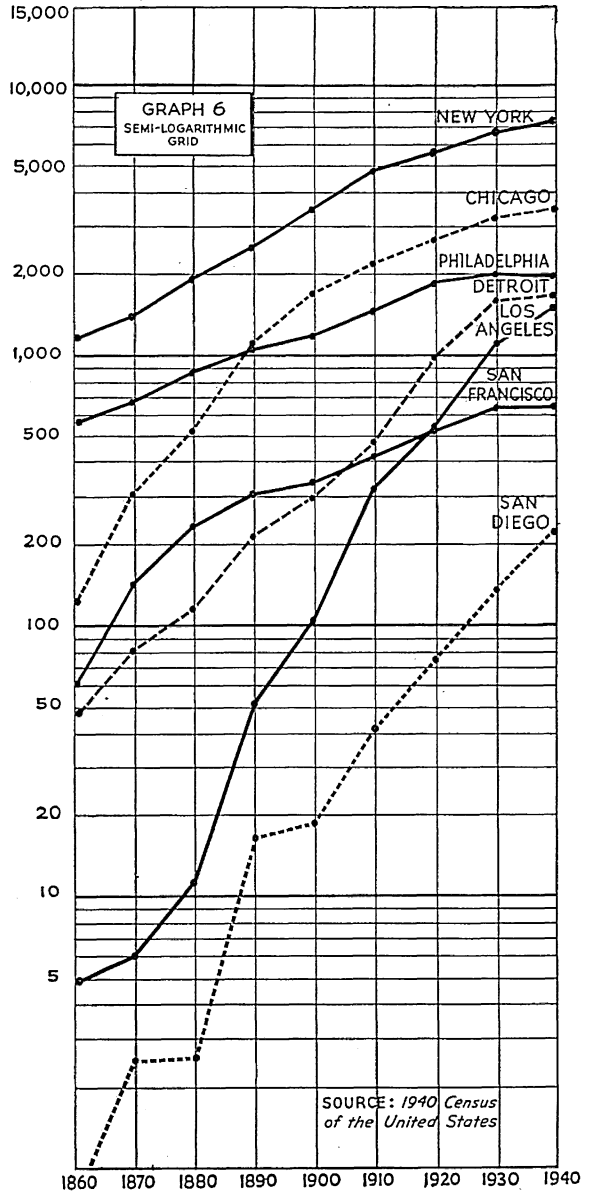
Index Numbers and What They Tell Us

The changing prices of what we buy and sell present continual problems to the businessman, the housewife, the employer, the employee. Suppose meat which last year cost 25 cents a pound now costs 27 cents. We may say: (a) meat has risen 2 cents a pound; (b) meat costs 8% more; or (c) the index price of meat, with last year as base, is 108. The third form is probably the least familiar to you, but it is so widely used and so valuable that you should understand it. There is no way of comparing an increase of 2 cents a pound on meat with an increase of \$5.00 a month in a man's wages unless we can express each as a percentage of some former value. If a man who a year ago received \$100 a month now receives \$105, his wages are 105%

TABLE IV
POPULATION OF SELECTED CITIES
To Nearest Thousand (000's Omitted)

	1860	1870	1880	1890	1900	1910	1920	1930
New York.....	1,175	1,478	1,912	2,507	3,437	4,767	5,620	6,930
Chicago.....	109	299	503	1,100	1,699	2,185	2,702	3,376
Philadelphia....	566	674	847	1,047	1,294	1,549	1,824	1,951
Detroit.....	46	80	116	206	286	466	994	1,569
Los Angeles.....	4.4	5.7	11	50	102	319	577	1,238
San Francisco....	57	149	234	299	343	417	507	634
San Diego.....	.7	2.3	2.6	16	18	40	74	148

POPULATION OF SELECTED CITIES

ARITHMETIC CHART SHOWING ABSOLUTE GAIN
POPULATION
IN THOUSANDSRATIO CHART SHOWING RELATIVE GAIN
POPULATION
IN THOUSANDS

of their former amount. That is not so large an advance relatively as the change in the price of meat from 25 cents to 27 cents a pound. The wage index of 105 is less than the price index of 108.

The United States government collects data about all important products and about wages in the major industries, and it publishes tables showing how the index numbers of these items have varied over a period of years. The financial section of almost every newspaper contains graphs showing index numbers that give current information about business. With some particular year or group of years as base, the price in each year before or after is expressed as a

percentage of the price in the base year. This percentage is called an *index number*, or merely an index. To make clear the relation of the percentages to the base price, the latter is always stated as 100.

The index numbers shown in Graph 7 are from United States government figures with the average of the monthly values for 1923-25 taken as base. This chart is different from others that have been shown in that the base line is the heavy 100% line extending through the middle of the chart. Above and below this line the chart extends far enough to show all the points for the years under consideration.

The first thing we notice about this chart is that

the three lines tend to go up and down together. There is a general relationship between prices and wages. In 1920 the cost of living was high, but so were payrolls. Then cost of living dropped, but payrolls and employment fell even more, and 1921 and 1922 were very difficult years for workers with low wages. The year 1929 was a rather good one for the workers, with the cost of living relatively lower than employment and payrolls; but when the depression came, the drop in payrolls was far greater than the drop in the cost of things the worker needed.

Weighted Averages

Each of these index numbers is a *weighted average* of many items. For example, in considering the general cost of living we must consider food, clothing, rent, fuel and light, and miscellaneous items. Some of these may have gone up in price, while others have gone down. Some of them count more heavily in a family's budget than others. An increase of 2% in the cost of milk and butter may mean more than a rise of 10% in the cost of salt or vinegar. Before the items are added, therefore, each must be multiplied by an appropriate weight representing the relative importance of that item as obtained from a country-wide study of the cost of living.

Suggestions for Making Simple Graphs

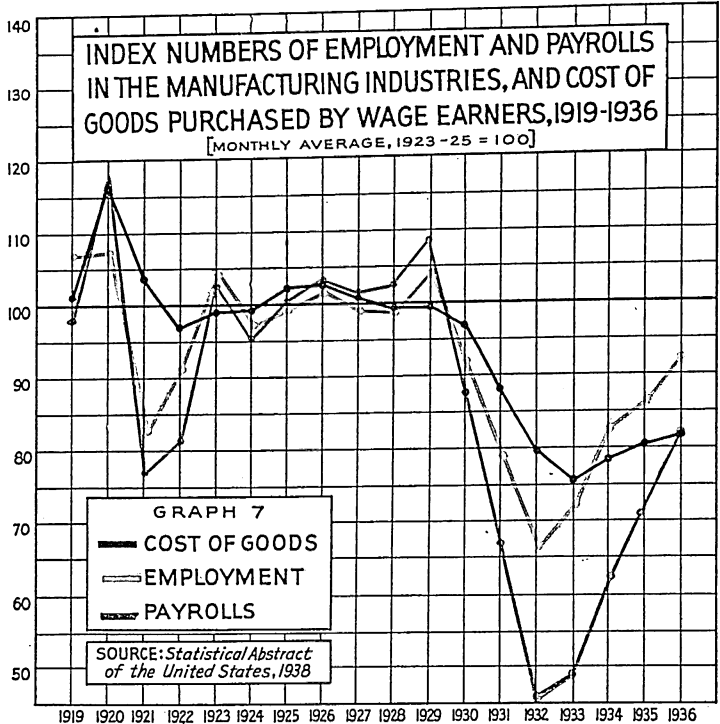
The professional draftsman uses specially designed pens and India ink. Boys and girls usually produce better-looking results with pencil or crayon. Use a moderately hard pencil.

For making bar graphs or line graphs you can buy coordinate paper in many different sizes and ruled in many ways. Paper ruled in 1/2-inch squares will serve the beginner as well as that with finer divisions. For ratio charts, buy semi-logarithmic paper. You can buy circles marked off in hundredths for circle graphs, but it is easy to make your own by using an ordinary compass to draw your circle and a small protractor to measure angles.

Strips of gummed tape make better looking bars than most amateurs can draw. Tape can be obtained in different colors, and when data for two or more groups are to be presented on one graph, it is effective to use a different color for each group. Bar charts look better if the bars are not the same width as the spaces between them. If there are only a few bars on your chart, have wide spaces between them; if you are using many bars, put them fairly close together. There is no space, of course, between the bars on a frequency distribution chart.

Plan your graph so that its total proportions will be pleasing, like the proportions of a good picture. Print your title in simple block capitals; be sure they are all the same height, and uniform. Fancy lettering spoils the effect of a graph. Use smaller letters and figures for the legend and for labeling the scales, but print these, too.

For line and bar graphs, make the horizontal and vertical base lines (the *axes*) heavy and the lines of the rest of the grid light. Make barely perceptible dots at the points through which your lines are to pass; draw your lines very lightly first, and after the whole graph is outlined faintly, go over it with a heavier pencil to emphasize those lines which ought to stand out clearly. Indicate the divisions of the scale clearly on the base lines and label each scale



accurately. Tell what the unit is. Give every graph a title that is precise and complete, so that your reader will understand exactly what story the chart tells.

GRASSES. Of the many plant families, the grasses are the most useful and important. They carpet a large part of the earth's surface and furnish, directly or indirectly, most of our food. The world's bread is made from the cereal grasses, such as wheat, corn, oats, rye, barley, rice, and millet; and cereals and other kinds of grasses furnish most of the pasturage that fattens our meat animals.

Grasses are also the most widely distributed of plant families. Pigmy grasses, mosslike grasses not over two inches high, cling close to the cold ground right up to the borders of the field of ice and snow. The giants of the family are the bamboos, which grow 100 feet tall or more in the burning heat of the tropics (see Bamboo). Other tall species form the almost impenetrable canebrakes of the South. These are used for fishpoles and for "reed" furniture and "cane-seated" chairs. Small and middle-sized grasses, growing in greatest luxuriance in the North Temperate Zone, make up most of the more than 4,000 species included in the family. In the United States alone there are more than 1,000 species. One dooryard may contain a dozen kinds or more.

Grasses grow on all kinds of soil and in all sorts of conditions. They thrive on the banks of streams, along the seashore, in the low, wet marshlands, in the sunny meadows, or in the shade of woodland and orchard. Some varieties, such as sweet vernal grass, June grass, and orchard grass, are among the first spring plants. Others, like timothy, redtop, and

hair grass, flourish in midsummer; and even fall has its grasses—the beard grass and the dropseed grasses of September.

The grasses can boast of their long ancestry, for they belong to one of the “first families” of the Vegetable Kingdom. As far back as history can go, grasses were growing in abundance. Just as today, they were among the first of plants to cover waste or barren ground and reclaim a neglected roadway or field.

One of the most important things grasses do is to bind down the soil until plants of larger and slower growth can establish themselves, and even then the grasses protect the roots of trees and our fences, roads, and buildings by forming a thick enduring carpet which prevents the wind and rain from carrying away their soil foundation or from blotting them out and burying them under shifting sands. In winter the grasses, changed from their beautiful green to colors of gold and brown, give protection to the seeds and tender bulbs during their long sleep under the snow.

The World's Greatest Pasture-Lands

The great natural pasture-lands of the world are the steppes of Russia, the pampas of South America, the vast plains of America, and the wide ranges or “runs” of Australia. Practically every farm has its pasture-land and the reason is easily understood. Fattening beef cattle, which would cost 20 cents on a ration of grain and roughage, costs only three or four cents a pound on pasture-land, and a cow pastured at a cost of three to five cents a day will give as much milk as when fed on grain and hay at three or four times the cost.

Grasslands of greatest perfection are lawns, especially the lawns of England and other old countries where they have been rolled, trimmed, and regularly watered for centuries. Lawn or pasture grasses have leaves that grow constantly from their bases so that when they are grazed or clipped they quickly grow up again. There are a number of ornamental grasses such as the ribbon-grasses, plume grass, Ravenna grass, Job's tears, and the tall plumed Argentine pampas.

Winners in the Race of Life

Grasses are well fitted for making their own way in the world, and if for any reason they are not wanted they become a most persistent weed, like the blue grass and quack grass which are among the worst weeds of our fields. Numerous are the devices for spreading their seeds, and grass plants are multiplied many times by growths from stolons or stems running along the ground, underground stems, and multiplying bulbs. Grasses are rapid growers, the larger species growing two or three feet and even more in 24 hours, and the 100-foot bamboos grow in from two to three months' time. Another special advantage which many of the grasses have is a peculiar structure of their leaves which protects them from drouth. Thin-

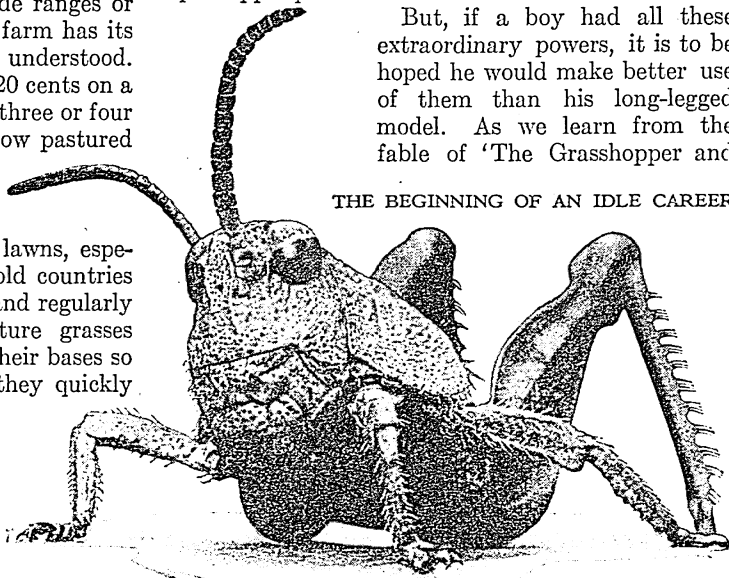
walled cells between the veins of the leaves keep them expanded under normal conditions but roll them up to prevent evaporation while drouth and hot winds threaten.

The botanical name of the grass family is the *Gramineae*. The plants are monocotyledonous, and their chief characteristics are the jointed stems with leaves arranged in two opposite rows, a single leaf at each joint of the stem. The stems are hollow except in corn, sorghum, and a few other varieties which have stems filled with soft pith. The leaf is a long narrow blade with its base inclosed in a sheath out of which it grows. The flowers are inclosed in glumes or chaff-like scales and are arranged in spikes like the wheatheads or in panicles like the oat. They depend upon the wind to scatter their pollen and do not have color or perfume to attract pollen-carrying insects. Clovers, alfalfa, and other plants which are grazed or cut for hay are often called grasses, although they are not true grasses.

GRASSHOPPER. If a boy could jump as far for his size as a grasshopper, he could easily spring to the roof of an eight-story building, or cover a long city block in two comfortable leaps. If he could make as much noise for his size as a grasshopper, the ground would tremble with the sound, and if he could eat as much and as fast as a grasshopper, he'd have to dine upon apple pies the size of cart-wheels.

But, if a boy had all these extraordinary powers, it is to be hoped he would make better use of them than his long-legged model. As we learn from the fable of 'The Grasshopper and

THE BEGINNING OF AN IDLE CAREER

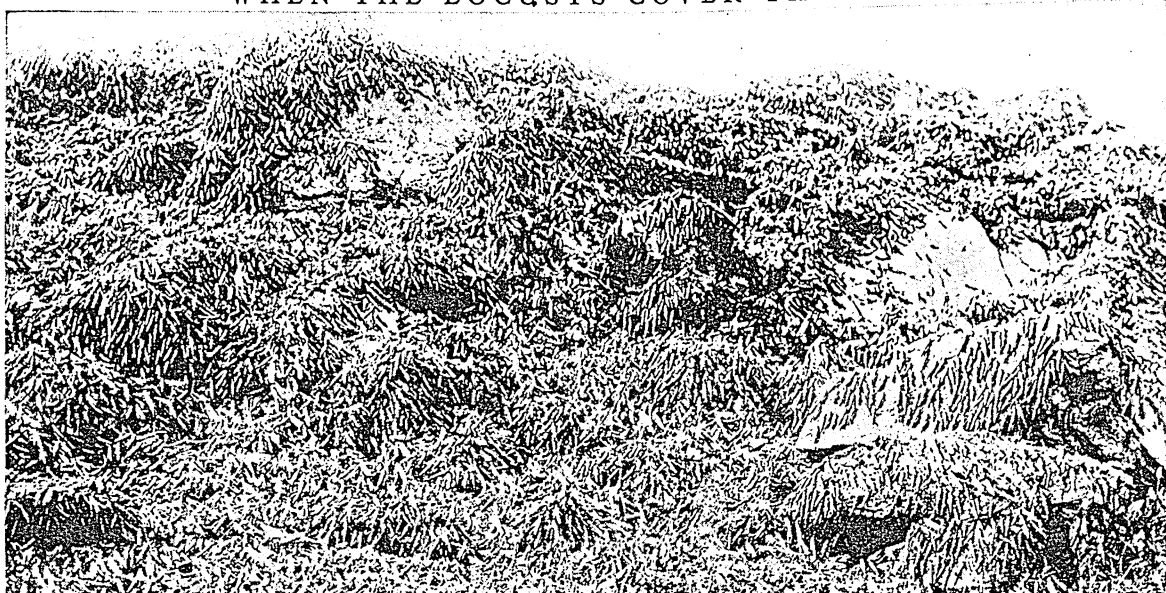


This is a much magnified view of a young King Grasshopper, just starting out in life. While he probably hasn't done much harm so far, it is very much to be feared he will follow the old family traditions of the grasshoppers and spend his days buzzing in the sunshine or devouring the farmer's crops.

the Ant', this foolish insect does no useful work, lays by nothing for the future, and wastes its time in tuneless song. In addition to these shortcomings, it has a greedy appetite for most of the things men grow in their fields and gardens. So it is classed as a pest, and has no friends except the birds and fish that feed upon it.

Everyone is familiar with the small green variety of grasshopper, which, as the name indicates, is usually found hopping aimlessly in the grass. With a quick hand they are easily caught, but if not held

WHEN THE LOCUSTS COVER THE LAND



Three hours before the picture was taken this field of wheat in the Transvaal, South Africa, was billowing in the breeze. Then a cloud of locusts appeared on the horizon, spread until the sun was darkened, and the air was filled with the humming of their wings. They settled down on field after field, covering them like living blankets, as you see in this picture, and the wheat was mowed down by millions upon millions of hungry jaws.

tightly will kick themselves loose with those powerful high-angled back legs. At the lower side of their helmet-shaped heads are the strong jaws with which they tear big pieces out of leaves or plant stems. When annoyed they will often spit out a brown liquid. Their front wings, which are tough and hard, lie straight along their backs, protecting the tender film of the back wings.

The green grasshopper "sings" by rubbing a file at the base of one front wing against a scraper on the other. Its ears are on its forelegs just below the first joint. Its cousin the katydid has the same sort of ears. (The picture with the Katydid article shows them plainly.)

Now imagine a grasshopper nearly four times as large as this one, with legs, jaws, and wings in proportion, and you will realize what the dreaded locust

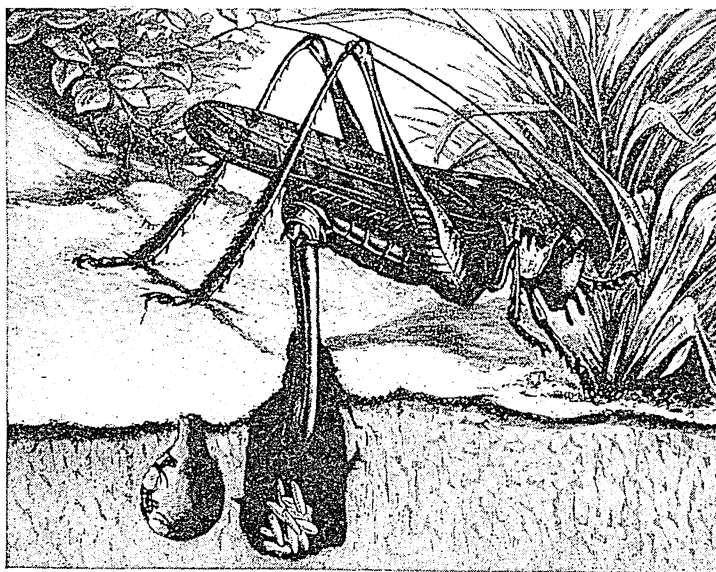
of Asia and Africa is like. This name "locust" is often improperly applied to the cicada, and to other swarm insects, but it properly belongs only to members of the grasshopper family.

A swarm of locusts which devoured the grain and left famine in its wake was one of the "seven plagues" of Egypt, told of in the Bible. Well, the descendants of those same locusts are still alive today.

It is impossible to give an idea of the billions upon billions of locusts which sometimes travel in these swarms. A cloud appears on the horizon like a black storm; it spreads until the light of the sun dies out; the air is filled with the deafening roar of countless wings.

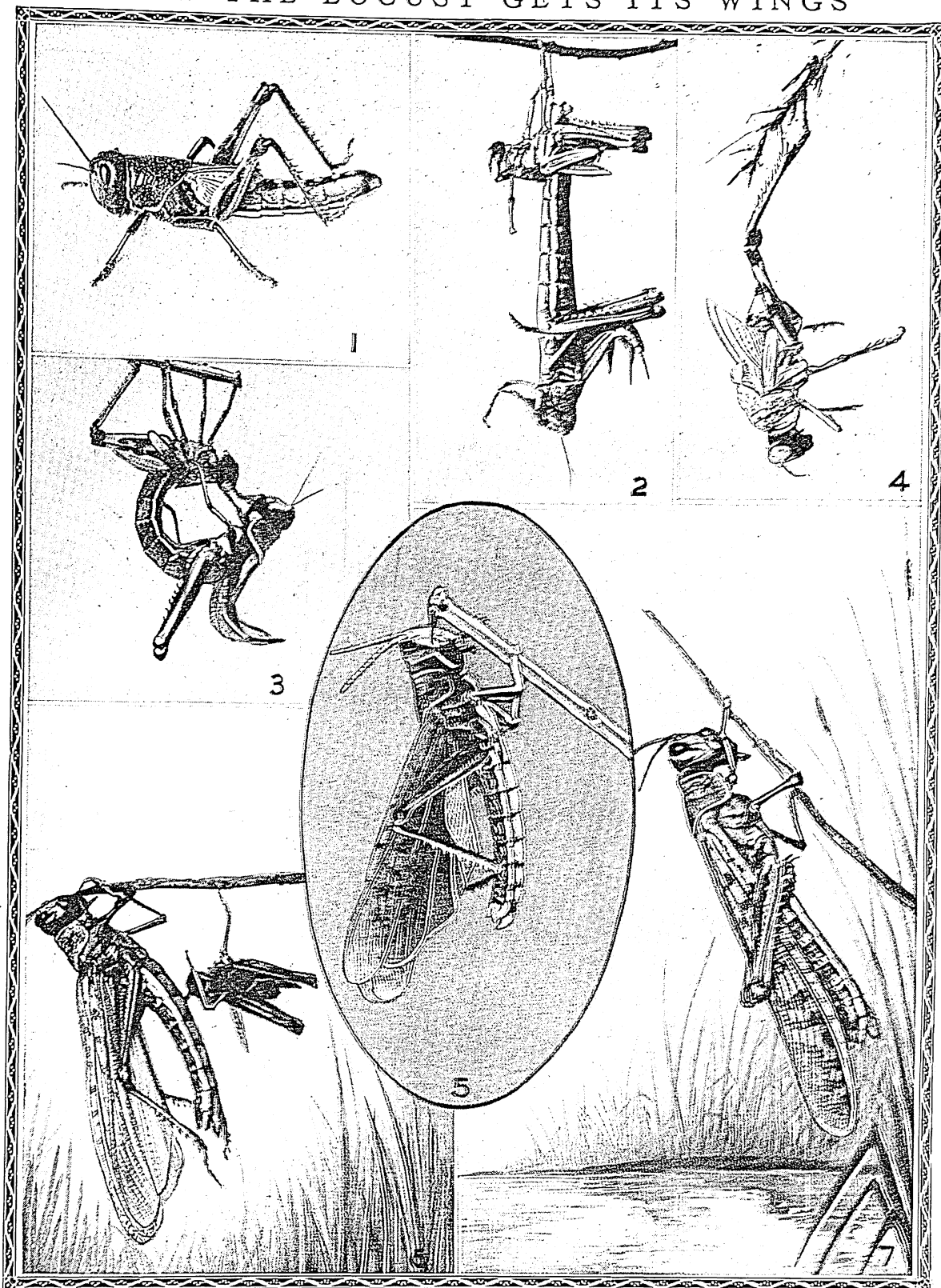
The inhabitants rush from their huts and raise their hands to heaven, praying the cloud will pass. But it settles down like a vast blanket, burying every-

MOTHER GRASSHOPPER LAYING HER EGGS



The female grasshopper with that drill of hers—the ovipositor—bores a hole in the ground sometimes four inches deep. There she lays her eggs. In the hole at the left the eggs have hatched and the young are crawling out. They are about the size of large ants and they spend the two weeks or so eating enormously before their wings come out. The long ovipositor and the long antennae are among the marks that distinguish the long-horned grasshoppers from the short-horned group that includes the locusts (see pictures on next page).

HOW THE LOCUST GETS ITS WINGS



1. The young Locust, a few days after hatching, its wings folded inside little cases on its back.
2. Shedding its "nymph" skin.
3. Almost out of the shell.
4. The old shell left hanging to a twig.
- 5 and 6. The locust drying and smoothing out its wings.
7. Resting after its first trial flight.

thing in sight, blotting out the landscape—for miles upon miles, nothing but a sea of locusts. Then the fatal march of the insect army begins. Before it stretch green fields; the dense column moves forward, and the green fields vanish. Behind the locusts, the ground looks as if it had been swept clean with a vast broom—not a spear of grass, nothing. A river bars the way. The front ranks fearlessly cast themselves upon the water, clinging together, pile upon pile, until a bridge of living insects forms, and the rear ranks march on to their work of destruction.

Locust Plagues in the West

In the United States the most dreaded pest of the grasshopper family used to be the Rocky Mountain locust. Migrating from their breeding grounds on the eastern slopes of the Rockies, these locusts would swarm over the fertile plains of the central states, leaving widespread ruin in their wake. The most damaging plagues occurred during the period between 1860 and 1880. Destruction of breeding grounds by settlement and cultivation has largely put an end to these invasions. The names "locust" and "grasshopper" are freely interchanged in popular usage between almost all members of the grasshopper family. But scientists make a distinction between the "long-horned" and the "short-horned" varieties.

The swarm locusts just described belong to the short-horned group, which includes also the brown field grasshopper with the stout red legs. The com-

mon green grasshopper, however, has long thread-like feelers and belongs to the long-horned group. The short-horned grasshoppers are also distinguished by having the noise-making apparatus between the hind legs and the wings, and the ears on the sides of the stomach, just behind the chest or thorax.

Where Grasshoppers Lay Their Eggs

Grasshoppers usually lay their eggs in holes which the females bore in the ground. When the young hatch, they look like tiny awkward models of their parents, except that their wings do not develop for some time. Their appetite, however, is large and they start at once their destructive feeding.

Many locusts seem to require a sandy desert soil for laying their numerous eggs, so that, fortunately, the more pernicious varieties tend to disappear with the advance of civilization. In ancient times locusts were often eaten by Asiatic and African peoples, and the custom still survives among certain desert tribes. The insects are usually roasted or baked, and then ground into a powder, which is mixed with flour for bread.

Scientific name of grasshopper order, *Orthoptera*. Short-horned grasshoppers belong to the family *Acrididae*. Some representatives are *Melanoplus spretus*, the Rocky Mountain locust, and *Melanoplus femur-rubrum*, the extremely common red-legged grasshopper. Long-horned species and katydids constitute the family *Tettigoniidae*. Members of this family fiddle by rubbing their wing covers together and listen with "ears" situated on their front legs. (See Katydid.)

The FORCE that Holds the UNIVERSE TOGETHER

*Story of the Mysterious Attraction that All Things Have for One Another—
Why Bodies Fall Down and Not Up—"Weight" and What it Means—*

The Discoveries of Newton and Galileo

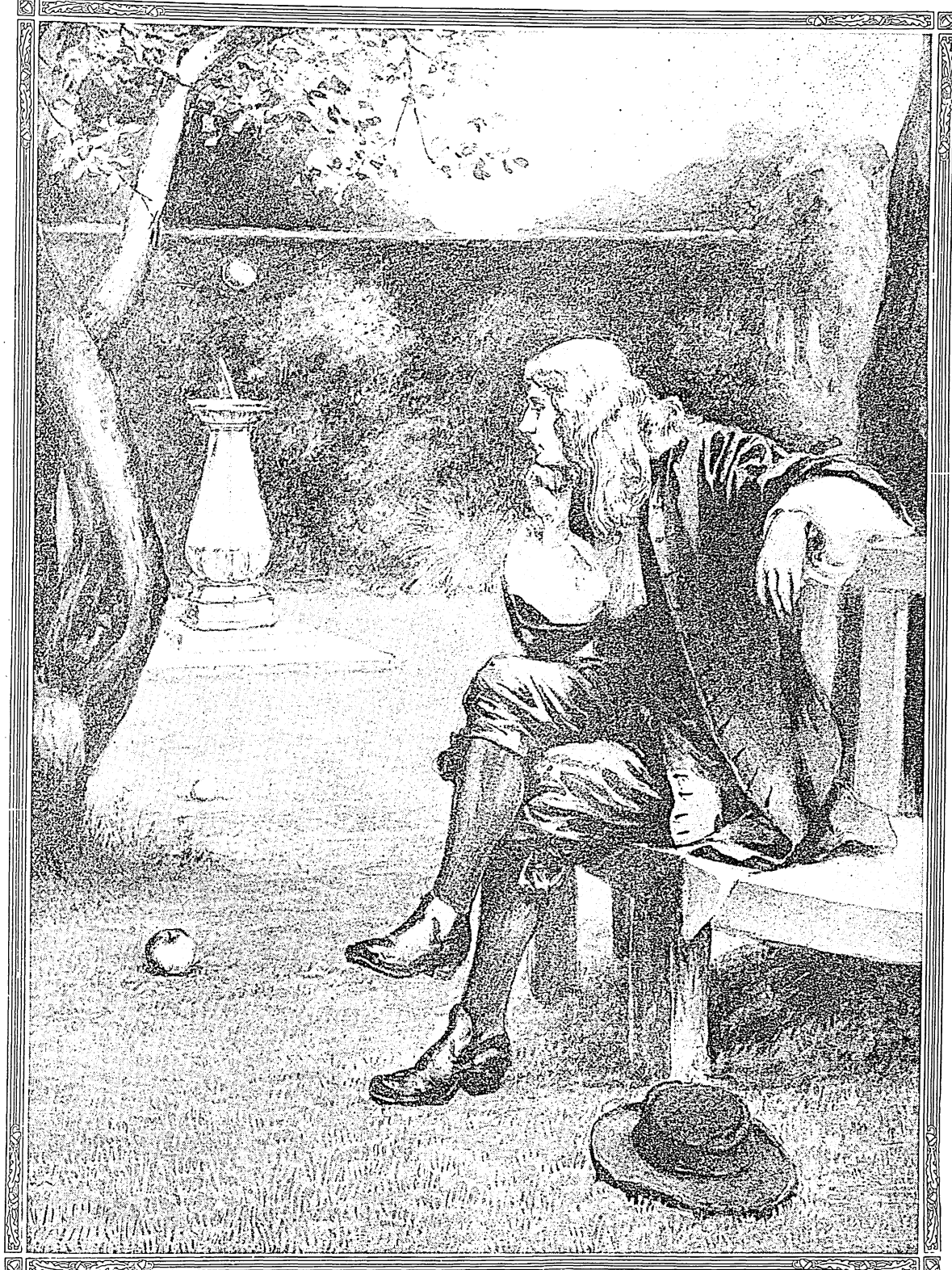
GRAVITATION. From the beginning of time a very remarkable thing has been happening, and few except very little children and very great philosophers have thought to ask why. That is, things have invariably been falling to the ground, and never in any other direction. Everything on the earth tends to fall, or to seek a lower position, unless held up by something beneath it. Even balloons and corks are not the exception that they seem to be. The force which causes bodies to act in this way we call "gravitation."

But is gravitation a mere local affair? What about other worlds than ours? More than 250 years ago a young man named Isaac Newton was walking in an English orchard wondering what the power is that keeps the moon forever swinging in its orbit around the earth, like a ball at the end of a string that a child keeps whirling around. Seeing an apple fall from a tree, he asked himself (so runs the story) if the same force which is so irresistible and so all-pervasive on earth might perhaps be the force that keeps the moon in its orbit by constantly pulling it toward the earth. Might not terrestrial gravitation be only one manifestation of a great universal Law of Gravitation,

ruling not merely the fall of terrestrial things, but all motion in the universe—even the stately swing of the planets about the sun and of other stellar systems out to the uttermost bounds of space?

Now Isaac Newton was not the first man to whom such an idea had occurred. The great mathematician and astronomer Ptolemy of Alexandria had surmised something of the kind in the 2d century A.D.; and others since that time had had vague inklings of the existence of the great and splendid force divined by Newton. It's a long way, however, from vague surmises to sound scientific theory based on proof, but the materials for such proof had been gradually accumulating from Ptolemy's time to Newton's. He attempted to put his theory to the test of calculation, but his results did not agree with the moon's observed course, and he laid by the idea for years. At length more accurate figures were obtained for the distance of the moon from the earth, and when these figures were used the calculation of the action of gravitation on the moon was found to agree exactly with the moon's course, and similar calculations applied to the other heavenly bodies completed the chain of evidence. Gravitation was proved.

HOW A LITTLE APPLE STARTED A BIG IDEA.



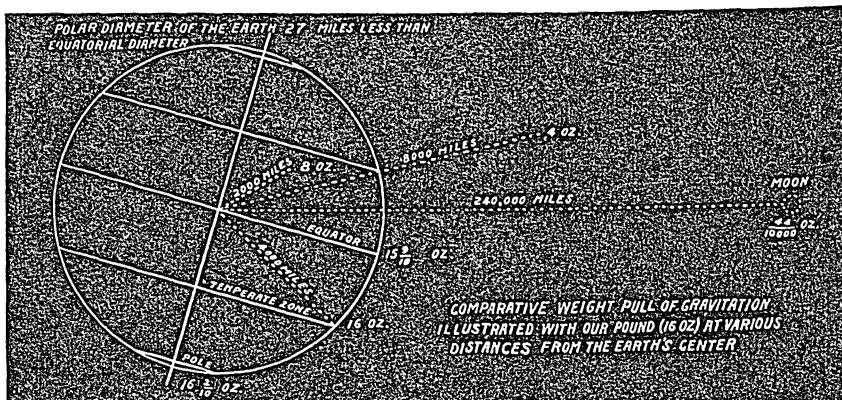
It was one of the greatest days in the history of science, according to Voltaire's famous story, when Sir Isaac Newton, sitting in his garden at Lincolnshire, noticed an apple fall to the ground and asked himself, "Why?" As he pondered this question, the great scientist conceived the idea from which he developed the Law of Gravitation. This "apple story," although it is now generally discredited, was long accepted as fact.

The great law of gravitation which Newton thus established is that *every mass of matter attracts every other mass of matter with a force which varies directly as the product of their masses and inversely as the square of the distances between them.* Observe, the attraction is mutual; if the earth attracts the grain of sand, the grain of sand attracts the earth. So the

In other words, a falling body drops 16 feet in the first second, 48 in the next, and 80 in the third—or 144 feet in the first three seconds. Every second that a body falls, it gains 32 feet over the speed it had the second before. Otherwise stated, the Law of Falling Bodies is that the distances traversed by any falling body from the beginning of its fall to any two or more points during the fall are to each other as the squares of the times in falling.

That is why you can fall from a chair to the floor without hurting yourself much, while, if you were to fall from the roof or upper window of a high building, you might break most of your bones, even if you were lucky enough not to be killed. When you strike the floor in falling from the chair, you are still moving comparatively slowly, while by the time you strike the ground in falling from the roof, you are moving with terrific speed. This is also why it is so much more dangerous to be struck by a brick or a stone dropped from a great height than by

HOW GRAVITY'S "PULL" AFFECTS WEIGHT



This diagram shows how the pull of gravity varies at different distances from the Earth's center. The unit of comparison is 16 ounces (one pound) weighed in the temperate zone. The general law is that the farther the object is from the center of the Earth, the less it weighs. Because the Earth bulges a little around the middle and is flattened at the ends, the pound will lose weight as you move it toward the Equator and gain weight as you move it toward the Poles. If the pound were taken to the Moon, the Earth's pull upon it would be only a fraction of an ounce. At a depth of 2,000 miles in the Earth, the pound would weigh only eight ounces. This seems to violate the law about "the nearer the center, the greater the pull." But remember that now the 2,000 miles of earth above our pound weight would be tending to pull it upward, thus counteracting a part of the downward pull.

planets pull the sun while the sun pulls them. This relation of the pulling power of gravitation to mass implies some rather surprising things with regard to conditions on other planets, which may be found in the article on Planets.

The most important step in the study of gravitation on the earth, before Newton formulated his law of its universal action, had been taken about a century earlier. For nearly 2,000 years men had been repeating the dictum of the great Aristotle that heavy objects fall more swiftly than light ones, and that the rate of speed is in proportion to the weight of the object. Not until the end of the 16th century was anyone so impertinent as to try to find out whether Aristotle could have been mistaken. Then an inquisitive young man named Galileo climbed the Leaning Tower of Pisa and dropped from the top two objects of different weights. They struck the ground at the same time! And great was the scandal thus created among the wiseacres, who wanted to know what the world was coming to, if a mere nobody were to be allowed to dispute the word of the infallible Aristotle!

But Galileo must needs experiment further, and find out that falling bodies constantly acquire more speed the farther they fall. An apple falling from the limb of a tree 16 feet above the ground strikes the ground in one second, and one dropped from a tower window 64 feet high strikes the ground in two seconds.

one which has fallen only a short distance.

The strength of the earth's pull on each object is the weight of that object, and since the strength of the pull diminishes as the distance increases, the weight of the same object varies at different points on the earth's surface. If you were to weigh five pounds of lead—or wood or cotton or anything—carefully on a spring balance at one of the poles, and then take it to the Equator and weigh it again on the same scales, you would see it stretch the spring a very little bit less, because it is farther away from the center of the earth. Likewise, you would find that the same object weighs less on a high mountain top than at sea-level, the difference being about 1/2,000 of the weight for every two miles of elevation.

Furthermore, the weight of an object is in proportion to its mass, that is, the amount of matter it contains. Two lead balls of the same size would not weigh the same, of course, if one were solid and the other hollow. A block of wood weighs less than a block of lead of the same size for a similar reason, namely, that the particles of matter in the wood are not so closely packed as the particles of matter in the lead. In other words, lead is denser than wood, and wood is denser than cork or cotton batting.

It is important to have a measure of density—of the closeness with which matter is packed—to know in short the "specific density" of different substances. It was Archimedes who first put us in the way to find

this (see Archimedes). Having noticed no doubt that any object suspended in water seems lighter than in air, Archimedes tried weighing various substances in air and water. Thus he discovered one of the most important principles of hydrostatics. This, the "principle of Archimedes," is that a body wholly immersed in any fluid is buoyed up by a force equal to the weight of the fluid it displaces.

If a substance is weighed first in air, then in water, and the weight in air is divided by the loss of weight in water, the result, which expresses the density of that substance as compared with water, is called the "specific gravity" of that substance. The specific gravity of gold is 19.3; that of silver, 10.5. That is, gold is 19.3 times as heavy as water, silver only 10.5 times. So, if Archimedes found the specific gravity of the king's crown to be less than 19.3, he was confirmed in his conclusion that the goldsmith had not made it of pure gold alone.

Another important division of this subject has to do with the "center of gravity" of solids. The center of gravity of any object is the center of its mass or weight. In a symmetrically shaped object of the same density throughout, the center of gravity will be at the geometrical center. If the center of gravity is "supported"—if a line dropped from the center of gravity passes through the base of the object—that object is in equilibrium and will not fall. This is the case with the Leaning Tower of Pisa, from which Galileo made his experiments. The tower stands safely, but if you want to know what would happen if it were to be built higher, try building a leaning tower of blocks. It stands so long as the center of gravity is over the base; but when the center of gravity is carried up so that it is no longer above the base, over goes your tower.

The tight-rope performer has learned by long experience to keep the center of gravity of his body

directly over his base of support, the wire. Of course the narrower the base the more difficult it is to keep the center of gravity exactly over it. This is why it is hard to balance a pencil or an umbrella, and also why tight-rope walking is difficult and dangerous. It is easier for a baby to creep than to walk, because when he is on all fours his center of gravity is carried over a broader base than when he stands on his feet.

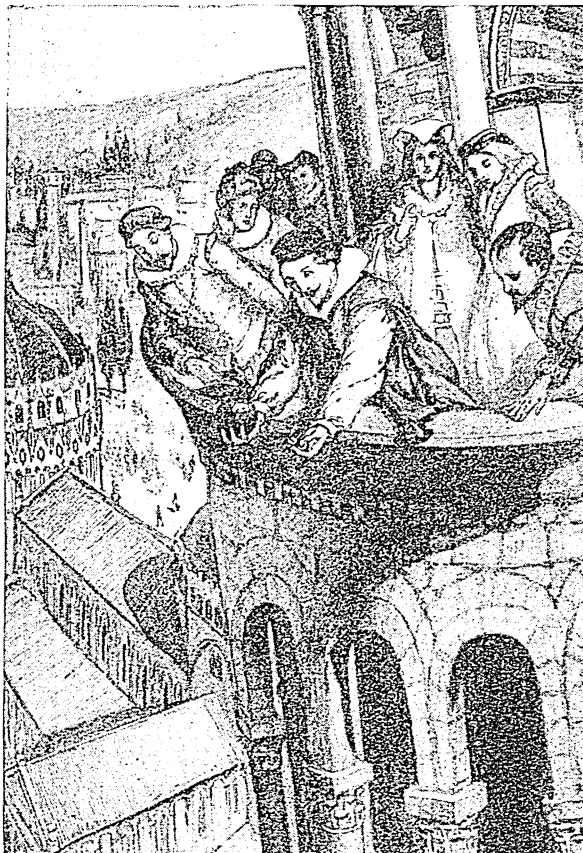
From the beginning of life to the end we are playing a game with the force of gravity. The baby trying to carry a spoonful of bread and milk to his mouth without spilling it, or to balance himself on his two little legs, is just learning to play the game. So are the architect and the engineer, each using all his knowledge of mathematics and physics in the construction of buildings, bridges, and railroads. So most emphatically is the aviator, whether he flies safely and sanely or performs daredevil "stunts." A curious game it is, with the force of gravity as both opponent and partner.

What has been explained here is but the beginning of a glimpse into the known facts of this great law; and don't imagine that everything about it is known even yet. From one point of

view it seems very simple—the most sweeping and unconditional generalization yet made in regard to the workings of the universe. But neither has Newton nor anyone else yet shown the nature of the force which operates through the law of gravitation. How the apple falls to the ground we know—it is in accordance with an unvarying universal law; but we don't yet know *why* the apple falls.

This question "why" is one of many attacked by Albert Einstein. His view is that the "attractive force" suggested by Newton can be replaced by certain other properties of "space," expressible only in highly complex mathematical terms. His theory works as well, however, as that of the "attractive force," and in some cases, better. (See Einstein, Albert.)

GALILEO'S EPOCHAL EXPERIMENT



Will a heavy object fall faster than a light one? There are still probably a good many people who would answer confidently, "Of course a heavy object will fall faster." That's what the world thought until Galileo went up in the Leaning Tower at Pisa, Italy, and made his famous experiments. He chose this tower, not only because it was high, but because he could drop things off without hitting the sides of the building on the way down. Here we see him just about to let fall two iron balls, one much bigger than the other. They both hit the ground at *exactly the same time*.

The NUCLEUS of a FAR-FLUNG EMPIRE

GREAT BRITAIN. A strip of water only 21 miles wide separates the French city of Calais from the "tight little island" of Great Britain. But the rough waters of the English Channel, the North Sea, Irish Sea, and St. George's Channel, which surround it, shut the people of Great Britain away from their enemies in the days of their weakness, and when they grew strong the sea furnished them broad highways by which they might trade with other nations. The people of Great Britain have put their trust in its waters, and their merchant marine and navy have made their land the "mistress of the seas."

This little island—about the size of Minnesota— which stands at the western door of Europe, has been favored by nature in many ways. It has an excellent climate, neither very cold in winter nor very hot in summer, and with an abundance of rainfall. Its broad deep rivers—the Thames, Humber, Severn, Mersey, and Clyde—admit ships a considerable distance into the land. On its fertile soil can be grown most crops of the temperate zone. And in its mountainous regions of the north and west are to be found deposits of coal and iron, without which Great Britain could never be an industrial nation. In her 88,210 square miles there is almost every kind of land, from the lowlands of southeastern England to the rugged highlands of Scotland and Wales.

Before 1707 Great Britain was merely a geographical name. The chief country in the island was England, to which Wales had been added by conquest in 1282; and to the north was the separate kingdom of Scotland. Since James VI of Scotland had ascended the English throne in 1603 as James I of England, the two countries had always had the same ruler. But it has only been since the Act of Union of 1707 that the two countries have been united under the name of Great Britain. In 1801 another Act of Union brought Ireland into the same government under the name of the "United Kingdom of Great Britain and Ireland." Since 1938 the greater part of Ireland has been a completely independent state; but Northern Ireland remains part of the "United Kingdom of Great Britain and Northern Ireland." This includes also the other British Isles—Orkneys, Shetlands, Hebrides, Isle of Wight, Isle of Man, and the Channel Islands.

The union of Scotland, Ireland, and England is shown by the flag of Great Britain. Before the first Act of Union the flag of England was white, with a large upright red cross; that of Scotland was blue, with a diagonal white cross; and a red diagonal cross was one of the emblems of Ireland. In the modern "Union Jack," all three of the crosses are united in a single emblem. (*See also* British Empire; England; Ireland; Scotland; Wales.)

—REFERENCE-OUTLINE for Study of GREAT BRITAIN and IRELAND—

A NUMBER of factors have contributed to make the island kingdom of Great Britain the richest and most powerful of all the nations of Europe. Cut off from the mainland by water, favorably situated for commerce, abundantly supplied with coal and iron for manufacturing, but unable to produce enough foodstuffs for its large population, it early became a seafaring nation. It organized a vast colonial empire and rose to commercial greatness in its efforts to secure food, raw materials for its industries, and markets for its manufactured products.

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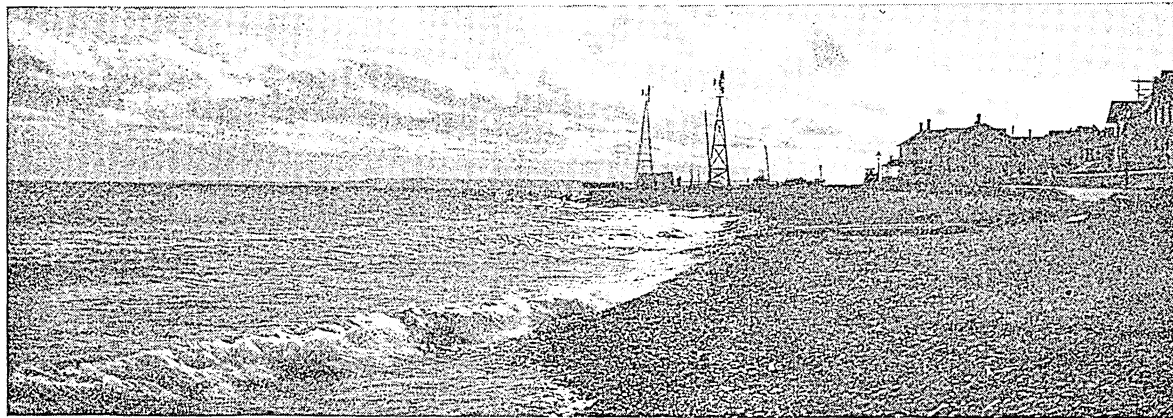
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The Five GREAT LAKES of NORTH AMERICA



Sunset on the Storied Shores of Mackinac Island

GREAT LAKES. The five huge lakes that lie in the heart of eastern North America form by far the greatest connected area of fresh water on earth. One of them indeed—Lake Superior—is bigger than any other fresh-water lake and bigger than any salt-water lake except the Caspian Sea. Put together, the five lakes would more than cover the states of New York and Pennsylvania.

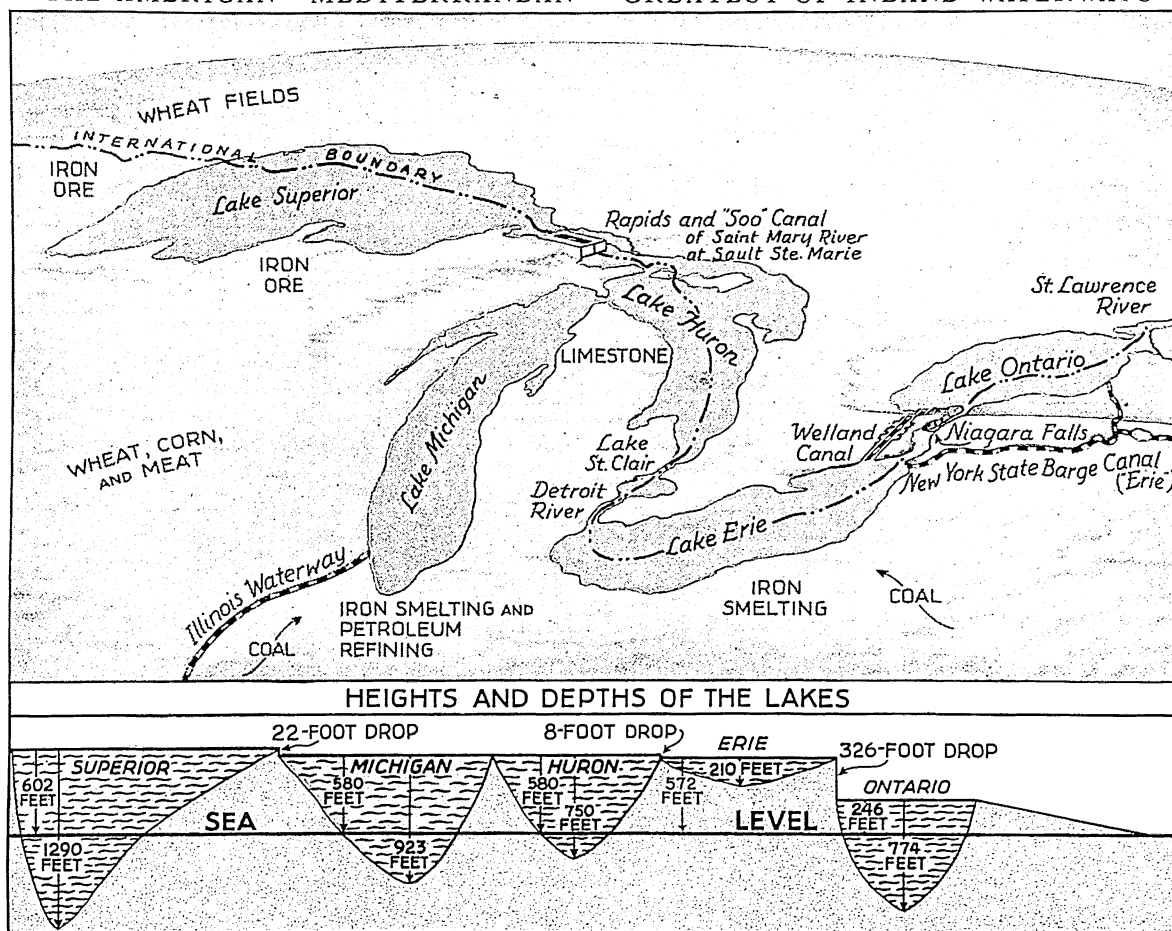
The map at the top of the next page shows that four of the lakes straddle the boundary between Canada and the United States. Only Lake Michigan lies wholly inside the United States. Of the total area, nearly 95,000 square miles, the United States has about 60,000 square miles.

Turn to the table in the Fact-Index under "Great Lakes." It gives the measurements of each of the

five Great Lakes. You will notice that Lake Superior is the deepest as well as the largest, Lake Ontario the smallest, and Lake Erie the shallowest. Lake Huron has the longest coast line.

A ship leaving Duluth at the extreme western tip of Lake Superior will travel about 1,160 miles before it reaches the place where Lake Ontario pours its waters into the St. Lawrence River. For a ship leaving Chicago at the head of Lake Michigan, the journey to the St. Lawrence would be about 60 miles shorter. If a vessel skirted close to the shores of all five lakes in succession and returned to its starting point, it would make a voyage of about 8,000 miles and would pass eight states (Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, Pennsylvania, and New York) as well as the Canadian province of

THE AMERICAN "MEDITERRANEAN"—GREATEST OF INLAND WATERWAYS



These blue waters carry the bread and iron of America. They tap the regions which supply most of the nation's iron ore, coal, grain, and meat and transport these products for a fraction of the cost of railroad transportation. Nature destined them to bear the world's greatest inland commerce, for only two artificial steps had to be constructed to make them navigable from end to end. As you see from the diagram below, the only abrupt drops from one lake to another are from Lake Superior to Lake Huron, and from Lake Erie to Lake Ontario. The map shows how these obstacles were overcome by the construction of the "Soo" and Welland ship canals.

Ontario. These eight states have more than a third of all the people of the United States.

With their connecting rivers and channels, this American "Mediterranean" forms the world's greatest inland waterway. Back and forth across it floats a volume of commerce greater than the entire foreign trade of the United States.

The Great Lakes make a series of four downward steps from west to east, as illustrated by the diagram under the map on this page. The waters of Lake Superior empty through the tumbling "Soo" rapids into the common level of Lakes Huron and Michigan (see Sault Sainte Marie). The next drop is through Lake St. Clair and the Detroit River into Lake Erie. Then comes the great plunge over Niagara Falls into Lake Ontario (see Niagara Falls). Finally the accumulated waters pour through the St. Lawrence River to the open ocean, 2,350 miles from Duluth.

Sources of the Great Lakes

Where does this flow of fresh water come from? What keeps these huge lakes filled year after year?

Surely, some mighty streams must drain into them. But if you look at the map of North America you will see that almost all the rivers of the surrounding regions flow away from the Great Lakes Basin. To the north and northwest they drain into Hudson's Bay; to the west and south they drain into the Mississippi system. Only a fringe of small streams and brooks empties into the Great Lakes. The 40-mile Nipigon River, flowing out of Lake Nipigon into Lake Superior from the north, and the slender Muskegon and Manistee rivers of the lower Michigan peninsula are among the largest lake tributaries.

These small streams contribute little. The main source of supply is the ground water (water table) that lies close to the surface of the whole Great Lakes region. The lake beds are simply basins that dip below the level of this ground water and thus are kept filled by seepage and the flow of innumerable small springs. The lakes may be compared to gigantic drainage ponds or rain pools. Elsewhere in this region, wherever the surface of the lands dips a little

deeper than usual, water appears. This explains the countless small lakes of Minnesota, Wisconsin, Michigan, and the Canadian province of Ontario.

The division is very slight between the land that slopes to the Great Lakes Basin and the land that slopes to the Mississippi Valley. From the same under-

tend to keep the bordering lands cooler in early summer and warmer in early winter than they would be otherwise. On the southeastern shores of Lakes Erie, Ontario, and Michigan and on the Door Peninsula of Wisconsin are extensive orchards and vineyards that owe their existence largely to the tempering influence

of the lakes. In the spring, westerly winds blowing across the winter-cooled lakes delay the blossoming of fruit trees until danger of frost is past, and, in the fall, warm breezes permit the fruit to ripen before killing frosts come.

On the other hand, the lakes breed sudden fogs and affect the behavior of passing storm centers in a way that is difficult

to predict. Strong winds may suddenly whip up the shallow waters along their coasts into high choppy breakers, particularly dangerous to pleasure craft not designed for rough weather. In winter, the storms that sweep the lakes match in destructiveness those of the Atlantic coast.

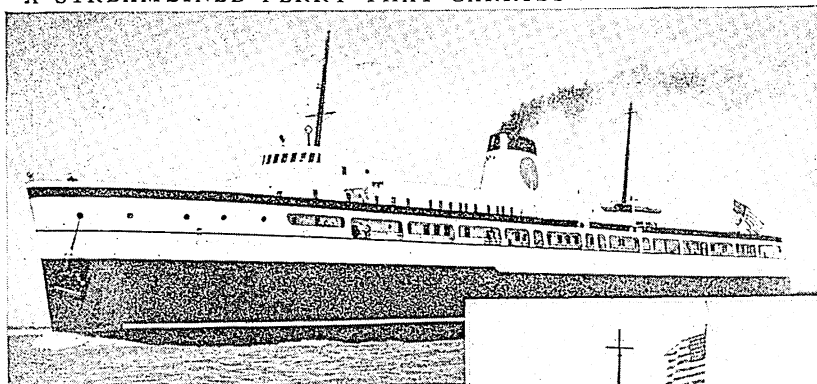
Economic Importance

The Great Lakes have played a unique part in the development of North America's

natural resources. They connect the rich agricultural and mining regions at their western extremities with the great industrial areas and large population centers of the East. More than 100 million tons of freight pass through the Detroit River in an average season, and the twin canals at Sault Sainte Marie carry more cargo than any other canal in the world—in some years more than the combined tonnage of the Suez and Panama canals. Moreover, this tremendous traffic is moved in a season limited to eight months, for ice closes the lakes, harbors, and channels to all but icebreakers from about mid-December to mid-April.

Lake transportation is far cheaper than rail. The prosperity of the American iron and steel industry depends very largely on the fact that the lakes bring together the raw materials for steel making at a minimum cost. On the borders of Lake Superior lie the world's greatest iron mines—the famous Mesabi, Gogebic, and other ranges of northern Minnesota, Wisconsin,

A STREAMLINED FERRY THAT CARRIES RAILROAD CARS



ground water table that supplies the Great Lakes spring also the headwaters of the Mississippi River and its eastern tributaries. It would be difficult to predict whether a drop of rain, absorbed by the soil near the western or the southern lake borders, would find its way out through the Great Lakes to the Atlantic Ocean or down the Mississippi to the Gulf of Mexico.

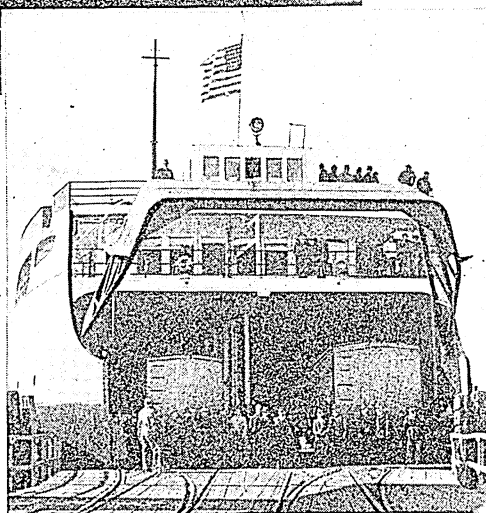
Since the level of underground water varies with the amount of rain or snow, the levels of the Great Lakes tend to fluctuate considerably in wet and dry years. Over a period of years the difference in level may be as much as 2 or 2½ feet.

Natural Environment of the Lakes

Three great tongues of land thrust out among the lakes—the upper peninsula of Michigan between Lake Superior and Lake Michigan; the lower peninsula between Lake Michigan and Lakes Huron and Erie; and the peninsula of southern Ontario between Lakes Huron, Erie, and Ontario. Each of these is ridged in part with low hills.

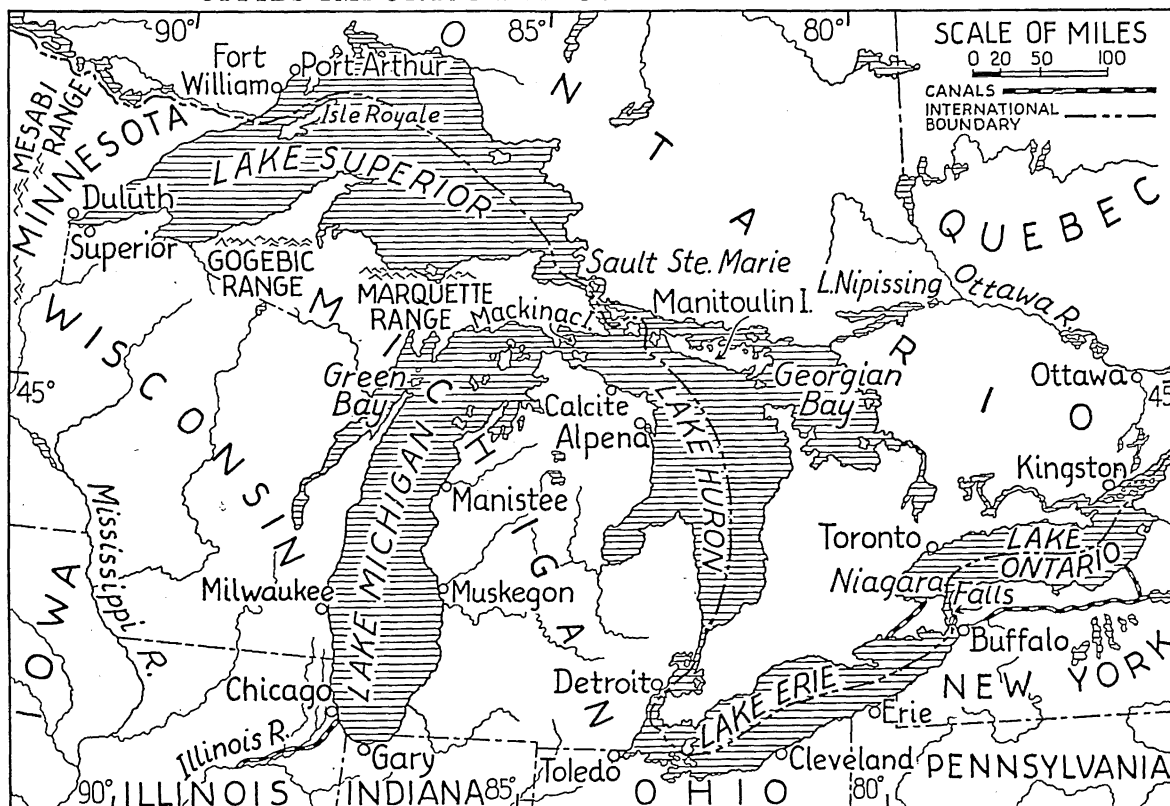
The borders of the lakes are generally low. In the north they are rocky in many places, but in the south they are mostly composed of sand, gravel, and clay. The forests that once came down to the shores have been largely cleared away for farms and cities or have been thinned out by lumberers. But, in the places where new vegetation has had a chance to spring up and replace the primeval forest, we find an extraordinary variety of flowers, shrubs, and trees. Deer, moose, black bear, porcupine, mink, and muskrat are still plentiful in the more remote sections.

Like all large bodies of water, the Great Lakes moderate the climate of adjoining regions. Lake winds



Twelve months in the year, regardless of storm and ice, great car ferries carry loaded freight cars across the lakes, saving many miles of travel by rail. They are stoutly built, for they are icebreakers as well as ferries. Some of them have staterooms for passengers.

CITIES IMPORTANT IN GREAT LAKES COMMERCE



The Great Lakes serve eight states of the United States as well as Canada's vast province of Ontario. Notice the great cities that have grown up along their shores, and the three iron ranges near Lake Superior that provide most of the nation's iron. Ships can reach the ocean through the Welland Ship and New York State Barge canals in the east and the Illinois Waterway in the west.

and Michigan. These usually supply about four-fifths of all the iron ore mined in the country. The ore is shipped east from the cities of Duluth and Superior for less than a dollar a ton to Gary, Ind., on Lake Michigan, and to the Lake Erie ports which serve the steel districts of Ohio and Pennsylvania. Limestone—needed in steel making—is shipped from Alpena and Calcite in Michigan to the steel districts.

West of the lakes lies one of the most important grain-producing regions in the world. It includes a large part of the wheat-raising areas of the United States and nearly all the wheat territory of Canada. Without cheap lake transportation the farmers of these regions could not reach their foreign markets on a competitive basis with the farmers of Argentina or Australia, where distances to the seaboard are not so great. Port Arthur and Fort William on Lake Superior are the outlets for the Canadian grain. The Duluth-Superior harbors on Lake Superior and Chicago and Milwaukee on Lake Michigan are the outlets for the grain of the United States. Like great funnels, these ports gather in the wheat of the Northwest, an average of 300 million bushels a year, to pour it out again at Buffalo and Montreal. And the cost is only a fraction of what it would be by rail.

The factories and railroads of the northern Middle West are powered in great part with coal from the

eastern Appalachian fields. The coal is shipped west from Lake Erie ports, principally Toledo, to Duluth-Superior for about 50 cents a ton, which is about one-fifth of the rate by rail. It affords a return cargo for some of the iron and wheat ships.

The Lumber and Oil Traffic

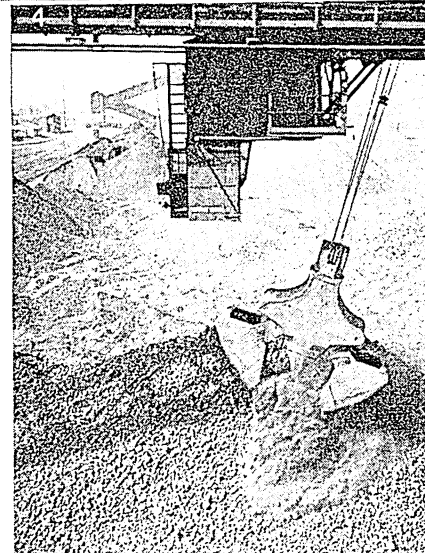
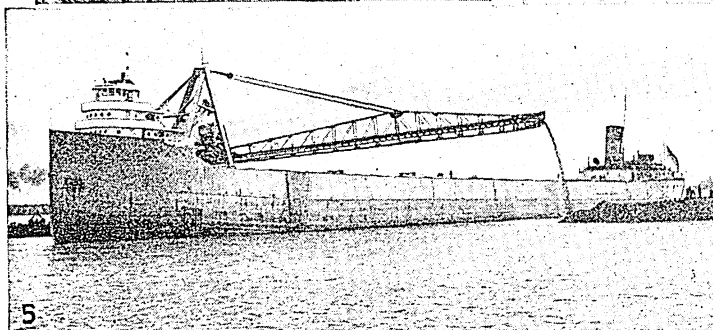
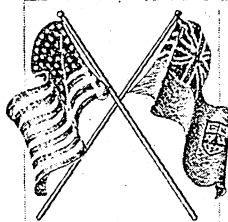
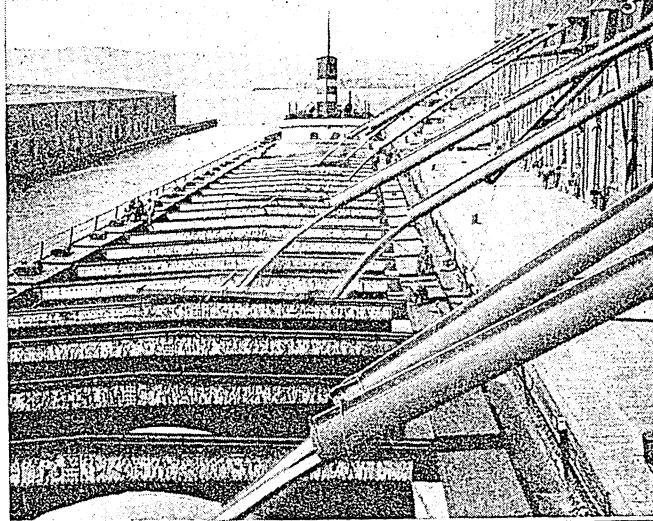
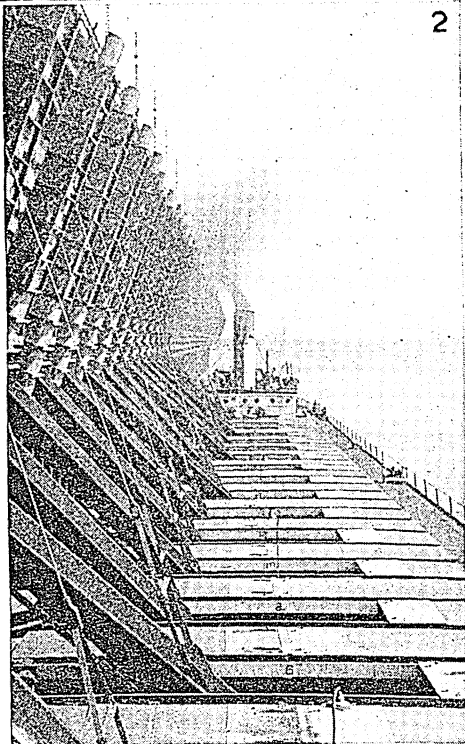
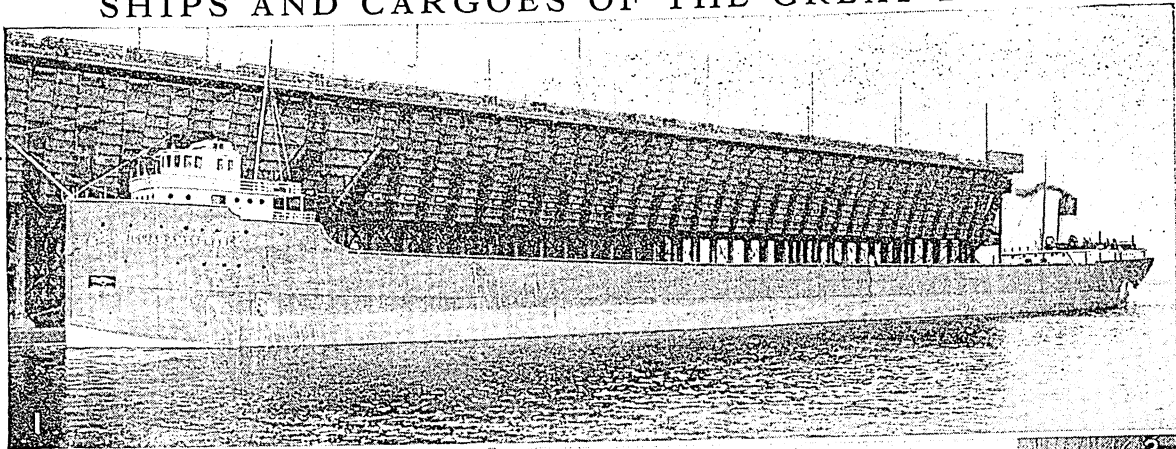
Lumber and lumber products, once the most important cargo on the lakes, are dwindling as the surrounding area is being stripped of its most valuable timber. Petroleum, on the other hand, is increasing in lake commerce. Most of it is shipped from the refineries at Indiana Harbor on Lake Michigan to Detroit and Lake Erie ports. Besides this "bulk freight," there is also an immense volume of "package freight"—miscellaneous shipments of manufactured articles and raw materials. Automobiles and trucks are moved by water from the Michigan factories to distributing points.

Channels of Navigation

To make the lakes navigable from end to end, work had to be done at only two important points. Canals and locks had to be built in the St. Marys River, and the Welland Ship Canal with its seven locks had to be dug around Niagara Falls (see Welland Ship Canal). The channel through Lake St. Clair and the Detroit River has also been deepened, but locks are not needed.

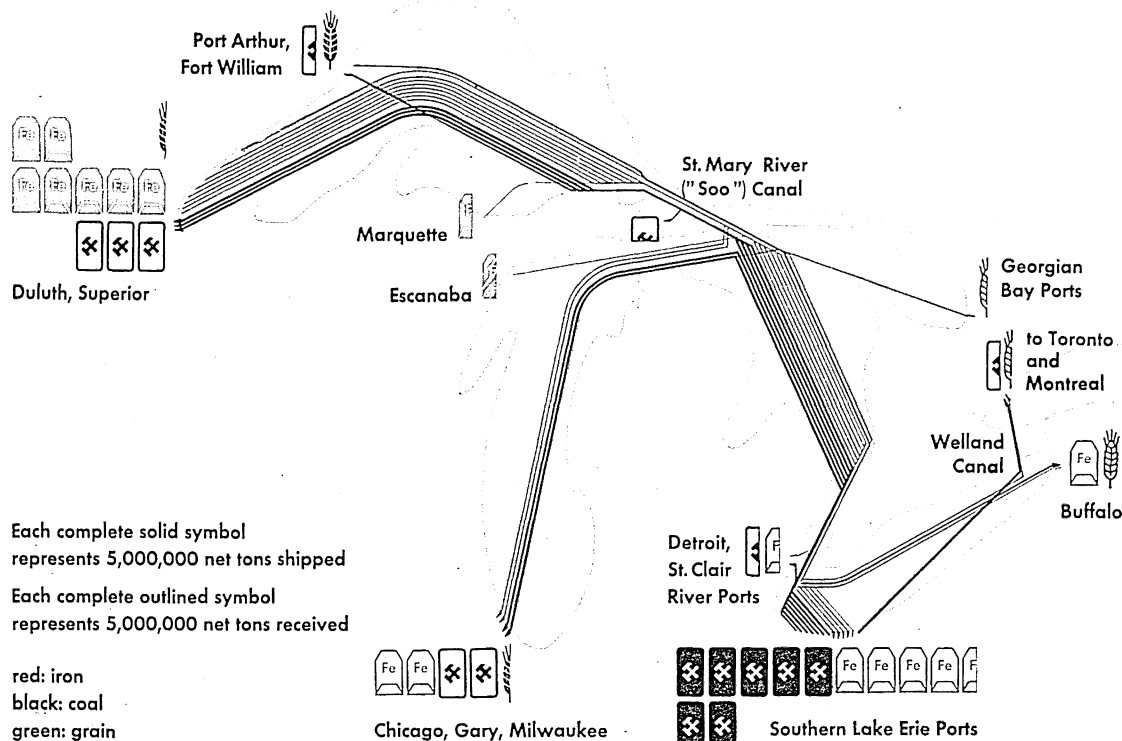
Today the main routes of navigation, the connecting passages, and the principal harbor channels are nor-

SHIPS AND CARGOES OF THE GREAT LAKES



1. Specially designed ships carry most of the bulk freight on the Great Lakes. A typical freighter is about 600 feet long and 60 feet wide, with a carrying capacity of 11,000 tons. In the extreme bow are the navigating and living quarters; in the extreme stern, the engines. Between the two is a single huge cargo space. The ship in our picture is alongside an ore-loading dock at Duluth. 2. Here we are looking toward the stern of the ship. The spouts from the storage pockets on the dock are lowered through the ship's hatches to pour the iron ore into the hold. A ship can thus load 10,000 tons of ore in two hours or less. 3. This picture shows pipes from a Duluth-Superior elevator pouring streams of wheat into a grain ship. 4. Ore boats bring back coal from Pennsylvania on their return voyages. Here a giant clam-shell scoop carried along on overhead tracks is unloading coal at Duluth. 5. To serve the lake ports that lack swift cargo-handling machinery, many freighters carry the kind of self-unloading equipment shown in this picture. Endless belts and bucket conveyors travel through the hold of the ship and out along that great swinging boom. The flags pictured above symbolize the peaceful sharing of the Great Lakes waterways by the United States and Canada.

Principal Commodities and Routes in Great Lakes Shipping



Prepared for Compton's Pictured Encyclopedia
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Iron and coal make up by far the largest part of the "bulk freight." Iron ore from the mines of Minnesota, Wisconsin, and Michigan is loaded at the twin ports of Duluth and Superior at the western end of Lake Superior and carried to the great iron and steel plants on the other lakes—to

Milwaukee and the Chicago-Gary region, to Detroit, to the cities of northern Ohio, and to Buffalo. Marquette and Escanaba are other iron-shipping points. Coal from the Appalachian fields is shipped from Lake Erie ports. Most of it moves west to the manufacturing and distributing

centers on the other lakes. Grain from western Canada and from the Great Plains states of the United States is shipped from western ports to eastern cities for processing and export. Since tonnage figures vary from year to year, the quantities shown represent a ten-year average.

mally 20 feet deep or more. This means that large ocean-going ships could travel the lakes without difficulty when they entered these waters. But traffic between the lakes and the ocean is limited by shallow channels. The St. Lawrence River between Lake Ontario and Montreal forms many impassable rapids, and the canals that have been built around them are limited to vessels of 14-foot draft. A proposal that the United States and Canada unite in building and operating a larger and deeper "St. Lawrence Waterway" has been under discussion for many years. (See St. Lawrence River.)

The New York State Barge Canal system—including the historic Erie Canal—links Lakes Ontario and Erie to the Atlantic seaboard via the Hudson River. But much of it is only 12 feet deep. The Illinois Waterway leading out of Lake Michigan, through the Chicago Drainage Canal, the Illinois River, and the Mississippi to the Gulf of Mexico, is limited to barges and steamers of 9-foot draft or less. (See also Canals; Rivers and Inland Waterways).

Despite their limited facilities, these links with the sea carry a considerable volume of commerce. In some years about one-fourth of the grain carried on

the Great Lakes finds its way down the St. Lawrence and about one-tenth down the New York State Barge Canal. Bulk sulphur from South America, wood pulp from the Scandinavian countries, and many other goods from distant lands are brought to Great Lakes ports by light-draft ocean freighters.

Playgrounds and Fisheries

The Great Lakes are one of the nation's largest and most popular recreation areas. In summer, luxurious passenger steamers cruise them from end to end, offering all the delights of an ocean voyage for a small sum. Millions from the crowded cities of the surrounding territory come for vacations to their sandy beaches cooled by the lake breezes. Western and northern Michigan has the most valuable tourist industry in the country, with an annual business running to hundreds of millions of dollars (see Michigan).

One of the most famous vacation spots is Mackinac Island, at the north end of Lake Michigan in the Straits of Mackinac. This was at one time one of the important military posts of North America. It is famous for its clear air and cool pinewoods, its old fort, and its French and Indian traditions from fur-trading days. Along the southern shores of Lake

Michigan the wind-blown sand dunes with their unique vegetation have been preserved in the Indiana Dunes State Park (*see* Indiana). Beautiful Isle Royale at the west end of Lake Superior is a national park. In Georgian Bay, an arm of Lake Huron, the Canadian government has established the Georgian Bay Islands National Park. Point Pelee National Park, on the Canadian side of Lake Erie, is a famous migratory-bird sanctuary in a region remarkable for its semi-tropical vegetation.

The fisheries are another valuable resource of the lakes. In United States waters alone, fishermen take more than 90 million pounds in an average year, principally lake herring (cisco), perch, lake trout, pike, and whitefish. Lake Michigan and Lake Erie contribute about two-thirds of the catch. Both the Canadian and the United States governments maintain hatcheries to restock the lake with fish. An international Board of Inquiry was appointed in 1940 to study the depletion of the fisheries and to recommend uniform regulations for their control.

A Peaceful Frontier

Though about 1,600 miles of the boundary between the United States and Canada cut through the Great Lakes, no forts and no warships guard this frontier. Soon after the War of 1812, the two nations agreed to limit their naval forces to three small ships each on the lakes and one each on Lake Champlain, thus establishing the principle of disarmament which has since prevailed along the entire border between the United States and Canada. The agreement, known as the Rush-Bagot Treaty, was inspired by President Monroe and John Quincy Adams, then minister to Great Britain. It was negotiated by Richard Rush, acting secretary of state, and Charles Bagot, British minister at Washington. It was signed at Washington April 29, 1817, and approved by the United States Senate about a year later.

International questions relating to the use of the waters are referred to the International Joint Commission. This body was created by treaty in 1919 and organized in 1921. The lakes form a natural series of immense storage reservoirs, and the level of each largely depends upon conditions in the lakes above. Any permanent diversion of water, as for instance through the Chicago Drainage Canal, may lower the levels of the lakes and the connecting channels, thus making it impossible for ships to load to their maxi-

mum draft. It has been estimated that a decrease in depth of only one foot means a loss of \$7,000,000 a year to the lake carriers. Hence any changes that affect the level of the lakes concern both nations.

A Gift of the Ice Age

The basins of the Great Lakes were probably scooped out by the Ice Age glaciers (*see* Ice Age). Most geologists believe that the lakes occupy old river valleys, some of which once drained into the Mississippi, and others into the Atlantic across New York and Pennsylvania. The ancestor of Lake Superior, they believe, drained into the Mississippi at a point north of St. Paul. The ancestor of Lake Michigan drained across the site of Chicago into the Illinois and Mississippi rivers. Lake Erie waters emptied into the Ohio, and waters from the Lake Ontario region flowed southeast to the Atlantic.

When the glaciers pushed down from the north, the tremendous moving weight of the ice scoured these valleys deeper and wider. Then the ice melted and left massive beds of drift (sand, gravel, and rock) where the rim of the glaciers had been. These beds blocked the former outlets of the valleys. At the same time, as the weight of the ice was removed, the land rose, commencing in the southwest. This action tilted the surface of the region, so that water tended to flow from southwest to northeast. By the time the ice

retreated to northern Canada, all the lakes were draining down this tilt into the St. Lawrence River and the Atlantic Ocean.

But the present outlet through the St. Lawrence River is by no means stable, because the retreat of the ice from off Labrador and Hudson Bay has allowed this region to rise in recent times from southwest to northeast. This is causing a reversal of the older tilting, at the rate of five inches a century every hundred miles or

from nine to ten inches at the south end of Lake Michigan. If this should continue unchecked, at the end of a thousand years Lake Michigan would again flow into the Illinois River, for the divide between them near Chicago is only eight feet high today. By the year 3500 all the lakes except Ontario would flow into the Gulf of Mexico by this route. As evidence of this latest rise, geologists point to old shore lines, which lie at a slant with the present water levels.

Three Centuries of History

More than three hundred years have passed since the white man first sailed the Great Lakes. Canoes,

A LAKE MICHIGAN PLAYGROUND



Pleasure seekers as well as naturalists enjoy the celebrated sand dunes area at the foot of Lake Michigan. Here is a rich treasure land of plant life remarkable for its variety.

bateaux, and sailing vessels have come and gone. Furs have given way to grain and iron, and from the wilderness great cities have risen.

Samuel de Champlain is generally credited with discovering the Great Lakes in 1615, though his interpreter Étienne Brulé had visited Lake Huron several years earlier. Champlain followed the famous Algonquin route up the Ottawa River, portaging across to Lake Nipissing and thence down the French River to Georgian Bay and Lake Huron. From Huron he portaged east to Lake Simcoe and through a chain of lakes and the Trent River to Lake Ontario.

Jean Nicolet in 1634 was the first to explore Lake Michigan's shores, and Father Ménard was the first (1660) to go through Sault Sainte Marie on his voyage to convert the Indians of the Lake Superior region. The next year the traders Radisson and Groseilliers coasted along the shores of Lakes Superior and Michigan, returning to Quebec with 60 canoes laden with an immense cargo of furs. Erie was the last of the lakes to be reached by white men (1669), owing to the hostility of the Iroquois tribes. In 1671 Daumont de Saint Lussan at Sault Sainte Marie took possession of the entire Great Lakes region for France.

The first sailing vessel built on the lakes was La Salle's *Griffin*, which was launched on the Niagara River above the falls in 1679. The ship was lost in a storm on Lake Michigan with a valuable cargo of furs. Another quarter century passed before the first permanent settlement in this region was established at Detroit by Cadillac in 1701. After the surrender of Canada in 1760, the French flag on the isolated forts and villages was replaced by the British, and after the Treaty of 1783 the American flag waved on all the southern shores. In the War of 1812 several important naval engagements were fought on the lakes, notably the Battle of Lake Erie (see Perry, Oliver Hazard).

Soo Canal Opens Lake Superior

The westward movement after the war at first left the Great Lakes untouched. Transportation was so difficult that few settlers found their way into the lake region. But the opening of the Erie Canal in 1825 brought in a stream of immigration. Last to be settled was the Lake Superior area. When the state of Michigan in 1840 attempted to obtain a federal grant of land to build a canal at Sault Sainte Marie, Henry Clay obstructed the measure, declaring that the land was "beyond the farthest bounds of civilization, if not in the moon." The discovery of iron in 1844, however, gave the impetus to development of this region, and in 1855 the first "Soo" canal opened Lake Superior to the east.

Now the miner, the lumberman, and the farmer drove out the fur trader, who had held undisputed sway for 200 years. And the frontier forts and trading posts situated at strategic points became the great industrial cities of Chicago, Detroit, Buffalo, Cleveland, and many others. (See also articles on each lake; Furs and Fur Trade; and Great Lakes in the FACT-INDEX).

GREAT SALT LAKE. "The Dead Sea of the New World" is so salty that the human body cannot sink in it. At Saltair Beach one sees bathers sitting upright in the water with shoulders well out, or lying on their backs with head and toes above the surface. It is estimated that the lake contains 400 million tons of common salt. It is from four to seven times as salty as the ocean, the saltiness varying with changes in level.

The lake is in northwestern Utah, in the region known as the Great Basin. This vast depression between the Sierra Nevada on the west and the Rocky Mountains on the east is an arid region, deprived of rainfall by the high western mountains, and its waters have no outlet to the sea. Great Salt Lake is the largest of its lakes and the largest west of the Mississippi River. Utah Lake drains into it through the Jordan River from the south. Bear and Weber rivers are the largest inlets on the north and east. There is no outlet. Hence, as the water evaporates it deposits ever-increasing quantities of salt and other minerals.

The average area is about 2,000 square miles, the length 75 miles, the width 50 miles, and the average depth only from 15 to 18 feet. These figures vary widely with the amount of rainfall. The area in 1869 was 2,100 square miles. From 1900 to 1904 the lake nearly disappeared, much of it becoming a salt desert. In 1924 it was so high that engineering works near its shores were threatened. By 1935, after the severe droughts of the early 1930's, it was reduced to an area of 1,200 square miles and to a depth of less than seven feet.

The number of islands also varies with the level of the lake. When the water is low, some of them become peninsulas. Antelope Island, the largest, is used for sheep and cattle grazing. Several smaller islands are the breeding grounds of gulls, pelicans, herons, and cormorants. Among the few forms of life known to exist within the lake are blue-green algae, a brine shrimp, and two species of brine flies. There are no fish.

Remnant of Lake Bonneville

Great Salt Lake is a remnant of ancient Lake Bonneville. Thousands of years ago, the original lake covered ten times the area of the present lake to a depth of 1,050 feet. Its waters were fresh, for they found an outlet to the north through Red Rock Pass into the Snake River, thence into the Columbia River and the Pacific Ocean. High above the basin of Great Salt Lake on the mountain sides are still plainly visible the shore features of Lake Bonneville—its beaches, deltas, sand bars, cliffs, and promontories.

Salt is obtained by pumping the lake water into shallow basins and evaporating it in the sun. Sodium sulphate is also produced. Across the northern arm of the lake is the Lucin railroad cutoff. This remarkable engineering achievement includes 30 miles of trestlework and rock-fill on the lake bed. It eliminates the many curves and grades of the old route and shortens the distance by 44 miles (for picture, see Utah). Just west of the lake are the Salt Flats, on which many automobile speed records are made.

THE FORESTED SLOPES OF MOUNT LE CONTE



Mount Le Conte is the highest of three peaks in a long mountain of the same name. A memorable trip for many visitors to the Smokies is the climb to the summit to watch the sunrise. Patches of cultivated fields may be seen in the hollow at the right. The mountain was named for Prof. Joseph Le Conte, who helped explore the region.

GREAT SMOKY MOUNTAINS NATIONAL PARK.

The Cherokee Indians called the mountains of their ancestral home "Great Smoky" because of the blue-gray haze that veils their rounded summits. Even in brilliant sunlight a pure blue color bathes the distant views, deepening to purple in the shadows of the clouds. Color plays an important part in the beauty of these mountains in Tennessee and North Carolina. In the early summer entire mountain sides flame with pink, rose, and purple rhododendron. The first touch of frost in the fall sets the forested slopes ablaze with yellow, gold, and crimson. And the evergreens on the upper ridges are never greener than when they wear their winter's mantle of snow.

The national park, created in 1930, straddles the crest of the mountains from north to south along the boundary between Tennessee and North Carolina. It is about 54 miles long and 19 miles wide. Since it is within a day's journey of more than half the nation's population, this region of beauty and cool summers has become one of the most popular of the parks.

The Great Smoky Mountains, often called the Unakas, are the highest part of the Appalachian Mountain system (see Appalachian Mountains). Within the park 16 peaks rise more than 6,000 feet. The summits of Clingmans Dome (6,643 feet), Mount Guyot (6,621 feet), and Mount Le Conte

(6,593 feet) are popular objectives of hikers and horseback riders. At Newfound Gap (5,043 feet) a broad parking plaza gives motorists the opportunity to enjoy a majestic view. A seven-mile drive known as the Skyway extends from Newfound Gap to within half a mile of the top of Clingmans Dome.

The rocks exposed in the Great Smoky Mountains are among the oldest in the earth's history. They are part of the ancient land mass known to geologists as "Appalachia." From Appalachia came the sediments which were deposited in the shallow seas to the west and later formed much of the interior land surface of the United States. During several mountain-making movements Appalachia was elevated, and its rocks were folded and compressed. Then ages of erosion by wind and water carved them

into their present gentle and rounded contours.

Botanists say that this region is the original home of our present-day eastern vegetation. Almost un-

UPPER LAUREL FALLS



Laurel Falls, above Fighting Creek Gap, foams through a jungle of rhododendron. In early summer masses of rose-pink blossoms provide a colorful setting.

diameter of nine feet, a wild grape vine whose main stem is five feet in circumference, laurel shrubs 40 feet high.

Occasional treeless areas on the rounded mountaintops, locally known as "balds," are covered with grass

200 feet tall, with a

touched by the hand of man, with abundant rainfall (nearly 100 inches in a year) and fertile soil, plant life has developed in greater variety than anywhere else in the temperate world. About 150 species of trees have been found. All Europe has fewer than a hundred species. Here are the largest virgin hardwood and red spruce forests in the United States (202,000 acres). There are perhaps 2,000 species of higher plant life. Many make their finest growth in the Smokies, becoming giants of their kind—tulip trees nearly

and shrubs. They may be due to ancient windfalls, fire, or old Indian camp sites which destroyed the trees. From these open meadows may be obtained the best views of the surrounding mountains. Acres of rhododendron, laurel, azalea, and myrtle blanket the lower slopes and the deep ravines cut by rushing streams. The growth is so impenetrable that these areas are known as "slicks" or "hells." At the peak of their bloom in May and June the mountains are indescribably beautiful.

Animal life also is abundant. The Chicago Academy of Sciences has collected more than 50 species of mammals and a great variety of birds, reptiles, and amphibians. Large game, such as bear and deer, is increasing under park laws which prohibit hunting.

Scattered through remote little valleys and bottom lands are clearings where mountain families still live in self-sufficient, primitive fashion. Most of them have been moved out of the park, but a few hold life leases from the government. "Our contemporary ancestors," as they have been called, these mountain people are descendants of English, Scotch, and Irish settlers who made their homes in the coves and bottoms of the Smokies before the Revolutionary War. Isolated for generations, they have kept alive the speech, the ballads, and the customs of 17th- and 18th-century England. Many of the place names in the mountains reflect their picturesque speech—Long Hungry Ridge, Chunky Gal Mountain, Charlie's Bunion, and Shuckstack Gap. Their log cabins, their gristmills, their artistic weaving with its ancient traditional patterns, their wood-working, and other homecraft products are being preserved as a memorial of a vanishing culture.

GREBES (*grēbz*). The young grebe is a true "water baby." When he has pecked his way out of the egg, he finds himself on a raft-like nest floating among the reeds on the edge of a pond. For a few minutes he looks over the edge of the raft, and then down he goes, swimming with all the skill of an adult. But the young birds are weak and the parents often carry them on their backs. The chicks ride under the wing coverts with only their bright-eyed heads exposed. At the slightest alarm the parents' feathers completely hide them. The old birds will even dive with the little brood under their wings.

"Hell-diver" and "water witch" are popular names of the grebe, for its skill in diving is indeed uncanny. Swiftly and silently it vanishes under water, to come up far away among the protecting rushes. It also has

an odd way of tipping over backward, without leaving a ripple, until all but the bill is submerged.

On the water, grebes look like ducks, but they may be distinguished by their pointed bills, short wings, and almost complete absence of tail. On land they are extremely awkward. The legs are placed so far back that when they walk they carry their bodies upright, like penguins. Sometimes they wriggle along on their bellies, like seals. Unlike most diving birds, their feet are lobate; that is, the toes are united only at the base, each having separate membranous flaps. Their shanks are flattened to bladelike thinness. In flight the trailing feet act as a rudder, as the tail does in other birds. They have glossy-black or brownish-black upper parts, black or white throats, and white

A MOTHER GREBE AND HER WATER BABY

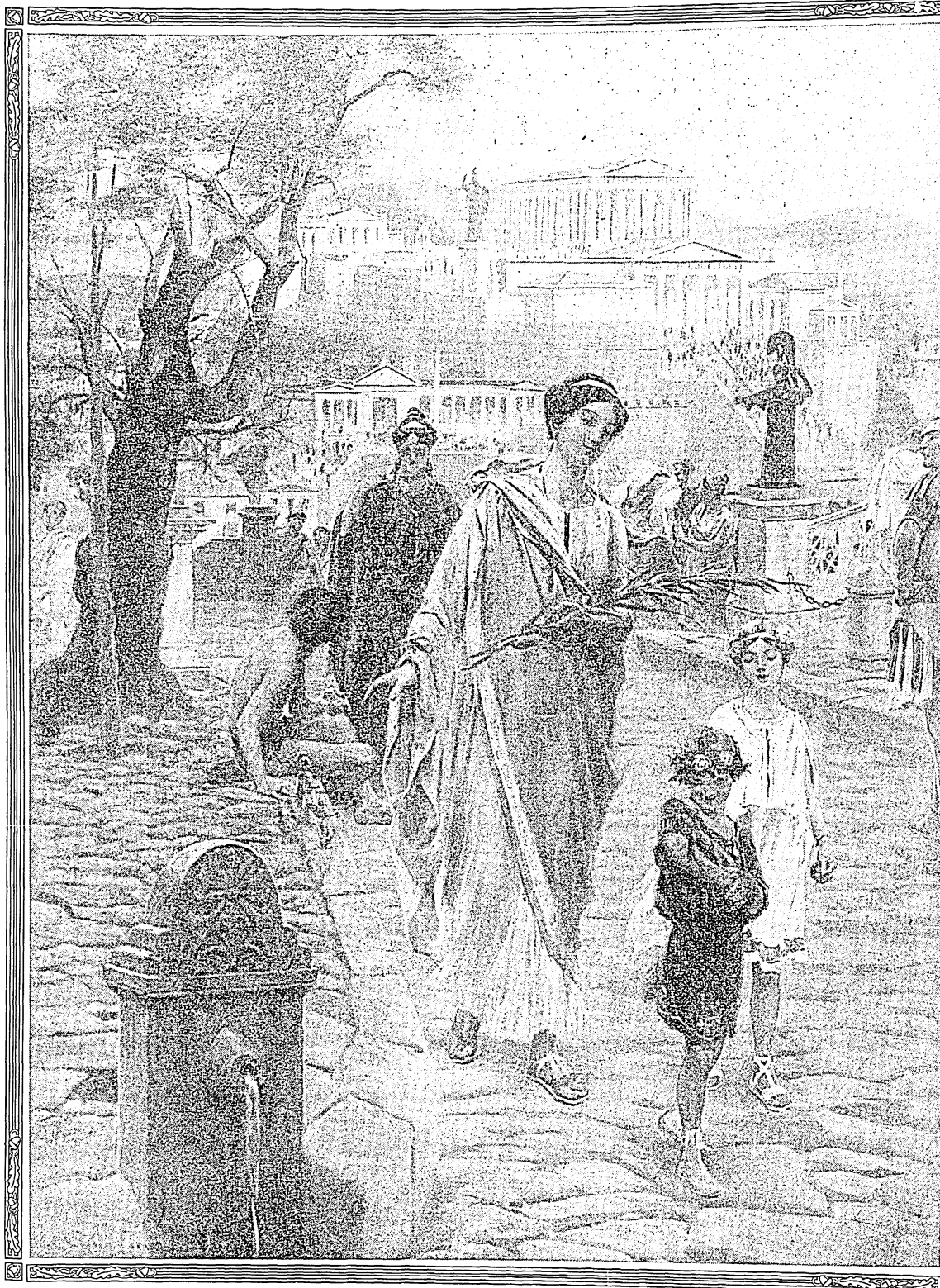


The little grebe was just hatched out of his egg in the floating nest and has promptly tumbled into the water for a swim. The parents never go out of sight of the nest without covering the eggs with decaying vegetable matter. This not only protects them from enemy eyes but keeps them warm so that they will hatch quickly.

under parts. The neck is long, and the head of the male is ruffed or crested in the breeding season. Holboell's, eared, and horned grebes have chestnut coloring on the head and neck, and on the sides of the under parts. They feed on fish, crawfish, and water bugs. In winter they desert their reedy ponds and sloughs for more open water and may sometimes be found far out at sea.

Grebes form the family *Colymbidae* of the order *Colymbiformes*. Six of the 20-odd known species are in North America. Most widely distributed is the pied-billed grebe, or dabchick, which is found throughout North and South America (for picture in colors, see *Birds*). The horned and Holboell's grebes range throughout North America, breeding in Canada and the north of the United States. The western and eared grebes range east to North Dakota and Iowa, breeding in the northern part of their range. The Mexican (or Least) grebe ranges from southern Texas to Panama.

A GOLDEN DAY IN GOLDEN GREECE



In this painting, the French artist André Castaigne has given us a glimpse of ancient Athens. In the foreground we see a Greek mother walking along the street with her children. Notice the stone pavement and the running water in the fountain. In the background is the Acropolis. Worshipers are climbing the steps to the Propylaea, the gateway to the temples. To the right of the Propylaea is the tiny temple of the Wingless Victory; to the left, Phidias' famous statue of Athena. On the top of the hill stands the Parthenon, the most beautiful temple in all the ancient world.

Where EUROPEAN CIVILIZATION was BORN



The Matchless Parthenon on the Acropolis of Athens, Once the World's Intellectual Capital

GREECE. The traveler in Greece often finds himself wondering how so small a country could fill so large a place in history. Even including the territories won as a result of the Balkan War of 1913 and the first World War, it is smaller than any of 20 states of the American Union.

From Mount Olympus, which marked the northern limit of ancient Greece, you can see over nearly all northern and central Greece; and if you take your stand on Mount Parnassus (modern Liakoura), which is near the center of Greece, you can see nearly all the mainland spread out below you like a map. Travel less than a hundred miles south, and from the mountains of Sparta you can see Crete, the southernmost of the 500 islands which make up an important part of Greece.

But though this little country is only a small patch on the map of the world, it was the cradle of European civilization and has wielded a greater influence on the course of history than any other single nation. Why? The answer is largely a matter of geography. It was their land and sea, their mountains, bays, and islands, that helped to make the ancient Greeks what they were and determined the course of their history.

First you must notice that Greece is the easternmost of the three peninsulas that Europe throws off into the Mediterranean toward Africa and Asia, where man first emerged from barbarism to civilization. Between the mainland of Greece and the coast of Asia Minor the sea is thick-strewn with hundreds of islands—the tops of submerged mountains that once formed a continuous land-bridge. These islands are

Extent.—North to south, about 365 miles; west to east, about 350 miles. Area, about 50,000 square miles. Population, 6,205,000.

Natural Features.—Deeply indented mainland coast, with many small islands, especially Cyclades and Sporades groups in Aegean Sea. Corinthian and Saronic gulfs nearly separate northern and central Greece from southern Greece (Peloponnesus or Morea). Four-fifths of the surface covered by complicated mountain systems, inclosing many small valleys; chief ranges, Cambunian and Pindus; highest point (in Thessaly), Mount Olympus (9,754 feet). No navigable rivers.

Products.—Wheat, barley, corn, and other cereals; currants, grapes, and wine; olives and olive oil, figs, oranges, lemons, etc.; tobacco, silk, cotton; sheep and goats; iron ore, lignite, magnesite, chromite, lead, salt; textile and leather manufactures, soap, cigarettes, rugs, ships; sugar and starch products, cheese.

Cities.—Athens (Athenai), the capital, and its port Piræus (Peiræus), combined population, more than 700,000; Saloniki (Thessalonica), 235,000; Patras, 60,000.

like a series of stepping stones, inviting to travel, and so the inhabitants of Greece were the first of European peoples to be brought into contact with the civilizations of Asia (see Aegean Civilization).

Look more closely at the map, and you will observe that the sea fairly riddles the land,

forming so many gulfs and capes that no part of Greece outside Thessaly in the north is more than 50 miles from the coast. So many are the indentations that the coast-line of the Greek peninsula is longer than that of Spain and Portugal, although those countries are six times its size. The greatest of these inlets is the Gulf of Corinth, which all but cleaves Greece in two. The only connection is the narrow Isthmus of Corinth (which is now cut by a canal), so that southern Greece, or Morea as it is now called, was known to the ancient Greeks as Peloponnesus (Pelop's Island).

Thus the sea everywhere opened its beckoning arms to the Greeks and invited them to the adventurous and progressive life of the mariner and trader. Their natural keenness and alertness was intensified by this constant intercourse with other peoples, their imagination and thought were stirred, forming fruitful soil in which the seeds of Egyptian and Asiatic civilization might bear new and finer flower.

This urge to the sea was reinforced by the character of the Greek land itself. Four-fifths of its surface is wrinkled by a complex system of mountain ranges which chop the surface up into a number of tiny plains. Practically all the arable land is contained in these little isolated valley-patches. One-third of all

THE LANDS WHERE THE ANCIENT GREEKS HELD SWAY



We must remember that in olden days the name "Greece" did not mean the Greek peninsula alone. It included also the "sprinkled isles" of the Aegean Sea, the western slopes of Asia Minor, Crete, Sicily, and southern Italy. Indeed, the last two were known as "Magna Graecia" (Greater Greece). In all these outlying lands were Greek colonies—mostly of the city-state type, patterned after Athens, Sparta, Thebes, and the other cities of the homeland. Although they were for the most part independent communities, often at war with one another, they were spiritually united by the great bond of Greek civilization and culture.

the surface today is waste land—rock and sand and gravel—with no soil that will grow even grasses. The remainder is divided between the forests, from which the Greeks obtained the charcoal that formed their only fuel, and the pasture land, most of it bristling with prickly asphodel and other dry scrub, too juiceless for the taste of any animals but sheep and goats. A few cows and pigs were raised, but sheep and goats supplied most of the meat that the Greeks ate, as well as wool and cheese. The "harvests of the sea"—chiefly tunny, sardines, and anchovies—largely took the place of meat in the Greek diet. On the scanty areas of tillable land were grown the "Mediterranean

triad"—grains, wine-grapes, and the olive—which formed their staple foods. Moreover these lands were far from being remarkable for fertility, and much hard labor was necessary to grow wheat and barley successfully. The few rivers are small and rapid none are navigable and many are dry in

summer. Thus, unlike the Italians, with their fertile soil, the Greeks were fairly pushed off the land to make good its deficiencies by trade and by settling the surrounding islands and coasts. Their constant

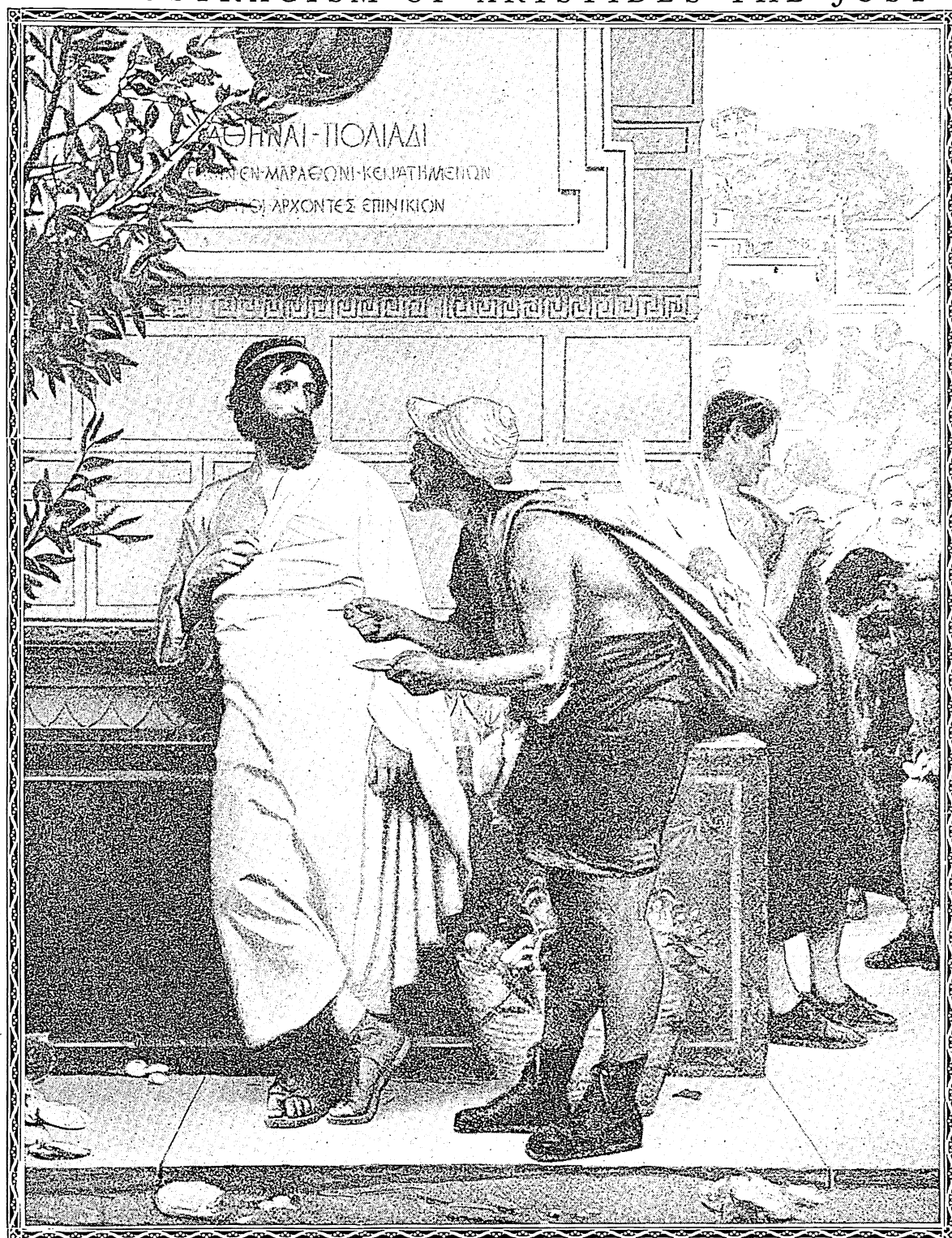
struggle with a nig-gardly land also tended to make the Greeks a vigorous and energetic people. Greece was, as Homer puts it, "rough, but a mother of men." This is no less true of the bracing winter climate. The summers are clear and almost rainless; the winters sharp with heavy rains and snows. No barriers intervene to break the force of the winds which sweep across from the Asiatic continent, and this helped make the Greeks a tough and hardy race.



One of the reasons for the downfall of Greece before the conquering sword of Rome was the lack of political unity between the many small states into which the peninsula was divided. These political divisions were caused by the numerous inlets from the sea and the many mountain ranges, shown in the map at the top of the page, which cut up the peninsula into a great number of more or less isolated valleys and plains.

The story of the coming of the Greeks into this land takes us back to about 1500 B.C., when wave after wave of barbarian invaders swept over the towns and cities of a great civilization, destroying it and then gradually building up a new civilization upon its ruins. About the splendid and far-flung

THE OSTRACISM OF ARISTIDES THE JUST



In democratic Athens unpopular statesmen were sometimes banished for a ten-year period. This was done by the process of "ostracism," named after the Greek word for "potsherd," because it was upon bits of broken pottery—the "scrap paper" of antiquity—that the voters wrote the name of the man they wanted banished. How unfairly the people sometimes used their power of ostracism is shown by the story told about the banishment of Aristides, the famous rival of Themistocles, which we see pictured above. An ignorant countryman has come to the voting place, and has asked a bystander to write the name of Aristides on his potsherd. That bystander is Aristides himself. "Has Aristides done you any injury?" he asks the countryman. "No," the other replies, "but I am tired of hearing him called 'the Just.'" So Aristides with a sad smile writes his own name.

culture which the rude Greek tribesmen found on their irruption into the Aegean basin—the Aegean civilization with its gold and bronze and pottery and paintings and its great palaces at Cnossus in Crete and at Mycenae and Tiryns on the mainland—you may read elsewhere (*see* Aegean Civilization). The Greeks who swept down from the north and overwhelmed these cities were simple nomadic herdsmen—a branch of the Indo-European race that had for centuries been drifting to the east and west from their home in the grass-lands east and northeast of the Caspian Sea (*see* Philology). The first wave of invaders were the fair-haired Achaeans of whom we read in Homer. The Dorians, who composed the second wave, came perhaps three or four centuries later, subjugating in their turn their Achaean kinsmen. Other tribes, the Aeolians and the Ionians, found homes chiefly on the islands and coasts of Asia Minor.

Life of the Early Wanderers

Something of the culture of the Aegean civilization these Greek—or, as the Greeks called themselves, Hellenic—invaders must have absorbed when they settled down and intermarried with the people they conquered. But, being still in the nomadic stage themselves, they were not fitted to come into the whole heritage of a city civilization. So of the earliest stages of the Greek settlement we know little, for these invaders were neither builders nor writers. But we may imagine them moving southward from their pasture lands along the Danube, driving their herds before them, bringing their families and primitive goods in rough ox-carts, stopping in one place just long enough to plant and harvest one crop. These families settle down in the pasture lands of the peninsula, gradually take up farming, and little by little form communities ruled by kings and elders.

At this point we can begin to picture them. For the background of the 'Iliad' and the 'Odyssey' is the background of the Age of the Kings (*see* Homer). We see the Achaeans living very simply, a race devoted to warfare. Their weapons and their songs are the only splendid things they have, except for the gorgeous robes and the beautiful jewelry and metal work they bought from Phoenician traders (*see* Phoenicians). The palace of Odysseus is built of wood, a hall about a court. In this hall they cook and eat. Sometimes it gets very smoky, for there are no chimneys. And the bed of Odysseus is no work of the cabinet-maker's art, but a very rude affair wrought by Odysseus himself out of a living olive tree.

In the 'Iliad' we see Greeks from many cities—Sparta, Athens, Thebes, Argos, and the rest—all more or less united to fight their common foe, Troy in Asia Minor (*see* Trojan War). In historical times the Greeks were again able to work more or less together when the power of Persia threatened them all. But Greece never became a nation. The only patriotism the Greek ever knew was loyalty to his city. This seems particularly strange to us nowadays, because their cities were so small. All the people of all of

them could be put into the city of New York and hardly show. Except Athens, probably no Greek city-state counted more than 20,000 citizens, and most of them were less than half that size.

The reason for this disunity we have already touched upon. Just as Europe today is chopped up into nations instead of being a few large political units as North America is, so on a smaller scale ancient Greece was divided by its mountain ranges. And even the plains thus inclosed were in many cases subdivided, containing several city-states each surrounding its acropolis or citadel. These flat-topped, inaccessible rocks or mounds—which will remind you of the mesas of New Mexico—are characteristic of Greece, and were first used as places of refuge. Dwellers of the Corinthian isthmus had the lofty Acrocorinthus, of Attica the acropolis of Athens, of the plain of Argolis the mound of Tiryns, and loftier still the Larissa of Argos. On these rocks they built their temples and their king's palace, and their houses clustered about the base.

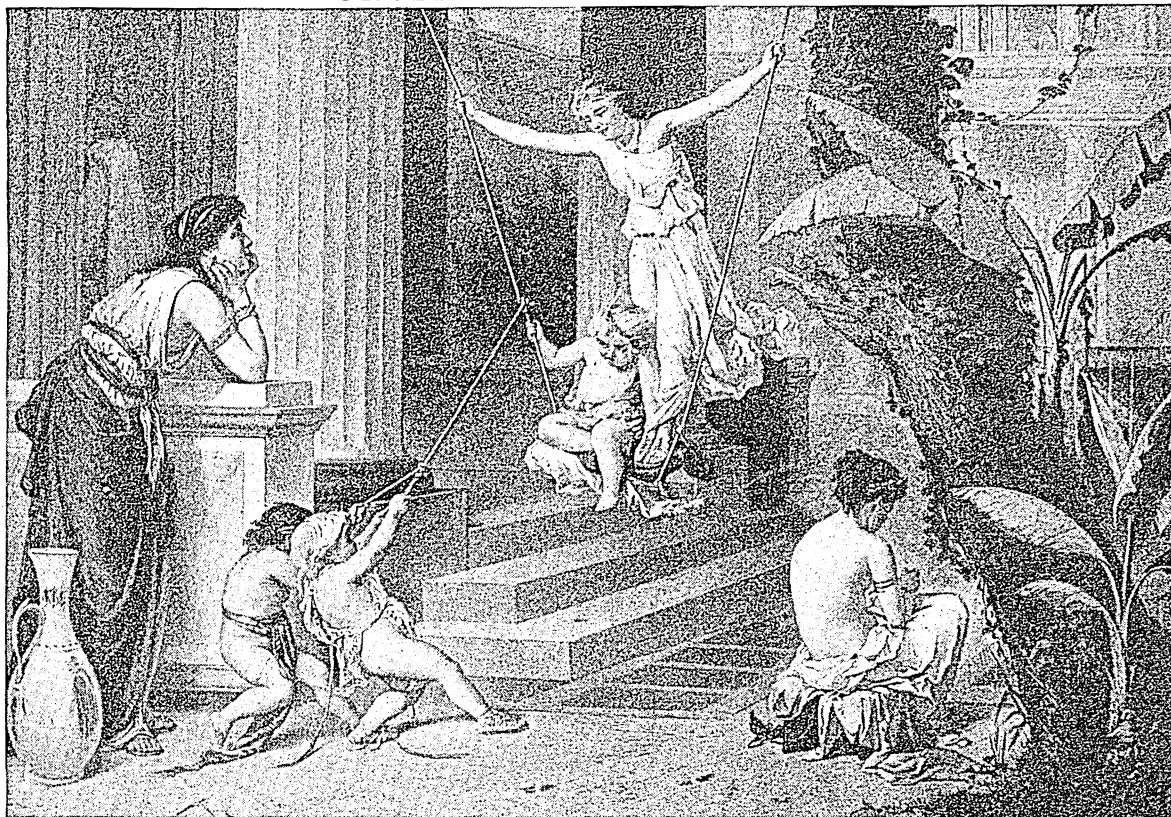
Only in a few cases did the city-state push its holdings beyond very narrow limits. Athens held the whole plain of Attica and most of the Attic villagers were Athenian citizens. Argos conquered the plain of Argolis. Sparta made a conquest of Laconia and part of the fertile plain of Messenia, the conquered people being subjects, not citizens. Thebes attempted to be the ruling city of Boeotia, but never quite succeeded.

Similar city-states were found through all the Greek world, which had early flung its outposts throughout the Aegean basin and even beyond. There were Greeks in all the islands of the Aegean: in Thasos, famous for its gold mines; in Samothrace, Imbros, and Lemnos, long occupied by Athenian colonists; in Lesbos, "where burning Sappho loved and sung," and Scyros, island of Achilles; in Chios, Samos, and Rhodes, as well as in the nearer-lying Cyclades—so called (from the Greek word for 'circle') because they formed a circle around the sacred island of Delos—and to the south in the island of Crete. The western shores of Asia Minor were fringed with Greek colonies, reaching out past the Propontis (Sea of Marmara) and the Bosphorus to the northern and southern shores of the Euxine or Black Sea. In Africa there were, among others, the colony of Cyrene, and the trading post of Naucratis in Egypt. Sicily too was colonized by the Greeks, and there and in southern Italy so many colonies were planted that this region came to be known as Magna Graecia, or "Great Greece." Pressing farther still, the Greeks founded the city of Massilia, now Marseilles, in Gaul.

The Lack of Political Unity

Separated by barriers of sea and mountain, by local pride and jealousy, the various independent city-states never even conceived the idea of forming a political unit of the Greek-speaking world, except as some powerful state embarked on a career of conquest

GREEK CHILDREN AT PLAY



The houses of the Greeks were usually built around a court, which was the "front yard" of the family and the playground of the children. Not only did the youngsters find swinging as delightful an amusement as do the children of today, but their games and toys were very much like our own. Here we see an idealized picture of a Greek home, one such as belonged perhaps to some rich Athenian. The costume of the woman at the left indicates that she is the children's nurse.

and attempted to make itself mistress of the rest. Many influences made for unity—a common language, a common religion (*see* Mythology), a common literature, similar manners and customs, the religious leagues and festivals, the Olympic Games (*see* Olympic Games)—but even in time of foreign invasion it was with the greatest difficulty that the cities were induced to act together.

The government of many of the city-states—notably Athens—passes through four stages as we watch it from Homer to historical times. During the 8th and 7th centuries B.C. the kings disappear, monarchy gives way to oligarchy, that is, the rule of the few. The power goes over to the wealthy land-owning nobles—the "Eupatrids" or well-born. But the rivalry among the nobles and the discontent of the oppressed masses are too great, and soon a third stage appears.

This third type of government is known as tyranny. Some Eupatrid suddenly seizes absolute power—usually by obtaining the favor of the people and promising to right the wrongs inflicted upon them by the other land-holding Eupatrids. He is known as a "tyrant," which among the Greeks was not a term of reproach, merely implying one who had seized kingly power without the qualification of royal

descent. The tyrants of the 7th century were a stepping stone to democracy, or the rule of the people, which was nearly everywhere established in the 6th and 5th centuries. For it was the tyrant who taught the people their rights and their power.

By the beginning of the 5th century B.C. Athens had gone through these stages and emerged as a democracy—the first democracy in the history of the world. Between two and three centuries before this the kings had been displaced by officials called "archons," elected by the nobles, and the aristocratic form of government was established. About 621 B.C. an important step in the direction of democracy was taken, when the first written laws in Greece were compiled from the existing traditional laws. This reform was forced by the peasants to relieve them from the oppression of the nobles. But this code, which was so severe that the adjective "Draconic," from the name of its compiler Draco, is still a synonym for "harsh," did not give sufficient relief. A revolution was only averted by the wise reforms of Solon, about a generation later (*see* Solon). But Solon's reforms only put off the fatal day, and in 561 B.C. Pisistratus, aided by the discontented, made himself tyrant. With two interruptions, Pisistratus ruled for more than 30 years, fostering commerce, agriculture,

and the arts, and laying the foundation for much of Athens' future greatness. His sons Hippias and Hipparchus attempted to continue their father's power, but one of them was slain by two youths, Harmodius and Aristogiton, who henceforth lived in Greek tradition as themes for sculptors and poets. By the reforms of Clisthenes, about 509, the nobles were shorn of much of their power, and the rule of the people was firmly established.

Very different was the course of events in Sparta (*see Sparta*), which had now established itself as the most powerful military state in Greece. Under the strict laws of Lycurgus (*see Lycurgus*) it had maintained its primitive monarchical form of government with little change. Nearly the whole of the Peloponnesus had been brought under its iron heel, and it was now jealously eyeing the rising power of its democratic rival in central Greece.

Suddenly there loomed in the east a thundercloud which threatened to sweep away the whole promising structure of the new European civilization. Persia, the great Asiatic world-empire of the day, had suddenly been awakened to the existence of the free peoples of Greece by the aid which the Athenians had sent to their oppressed kinsmen in Asia Minor. The dramatic story of how the scanty forces of the Greeks drove back the enormous Persian armaments is told in the article on the Persian Wars.

How Athens Rose to Power

From this momentous conflict Athens emerged a blackened ruin, but yet the richest and most powerful state in Greece. She owed this position chiefly to the shrewd policies of her statesman Themistocles, who had seen that naval strength, not land strength, was henceforth to be the key to power. "Whoso can hold the sea has command of the situation," he said. He persuaded his fellow Athenians to build a strong fleet—larger than the combined fleets of all the rest of Greece—and to fortify the harbor at Piraeus. This fleet became the instrument by which the Persians were finally defeated at the battle of Salamis, and also by which Athens made herself mistress of the Aegean. For, within three years after Salamis (480 B.C.), Athens had united the Greek cities of the Asiatic coast and of the Aegean islands into a confederacy (called the Delian League because the treasury was at first on the island of Delos) for defense against Persia; and in another generation this confederacy had become an Athenian Empire.

Almost at a stride Athens was transformed from a provincial city to an imperial capital. The bewildering rapidity of her leap to power makes us think of the transformation of Japan in the second half of the 19th century. Wealth beyond the dreams of any other Greek state flowed into her coffers—tribute from subject and allied states, customs duties on the flood of commerce that poured through the Piraeus, and revenues from the Attic silver mines. The population increased fourfold or more, as foreigners streamed in to share in the prosperity. Learning and

the arts flourished as never before in history. Painters and sculptors vied in beautifying Athens with the works of their genius—treasures which even today, battered and defaced by time and man, still remain among the wonder works of human skill.

This period, which stands out as one of the most remarkable and brilliant in the world's history, reached its culmination in the age of Pericles, 460–430 B.C. (*see Pericles*). Under the stimulus of wealth, power, abundant leisure, and free institutions, the citizen body of Athens attained a higher average of intelligence than any other society before or since. Sir Francis Galton, the eminent English scientist and anthropologist, says of them: "The average ability of the Athenian race is, on the lowest possible estimate, very nearly two grades higher than our own, that is, about as much as our race is above that of the African negro. This estimate is confirmed by the quick intelligence and high culture of the Athenian commonalty, before whom literary works were recited and works of art exhibited of a far more severe character than could possibly be appreciated by the average of our race."

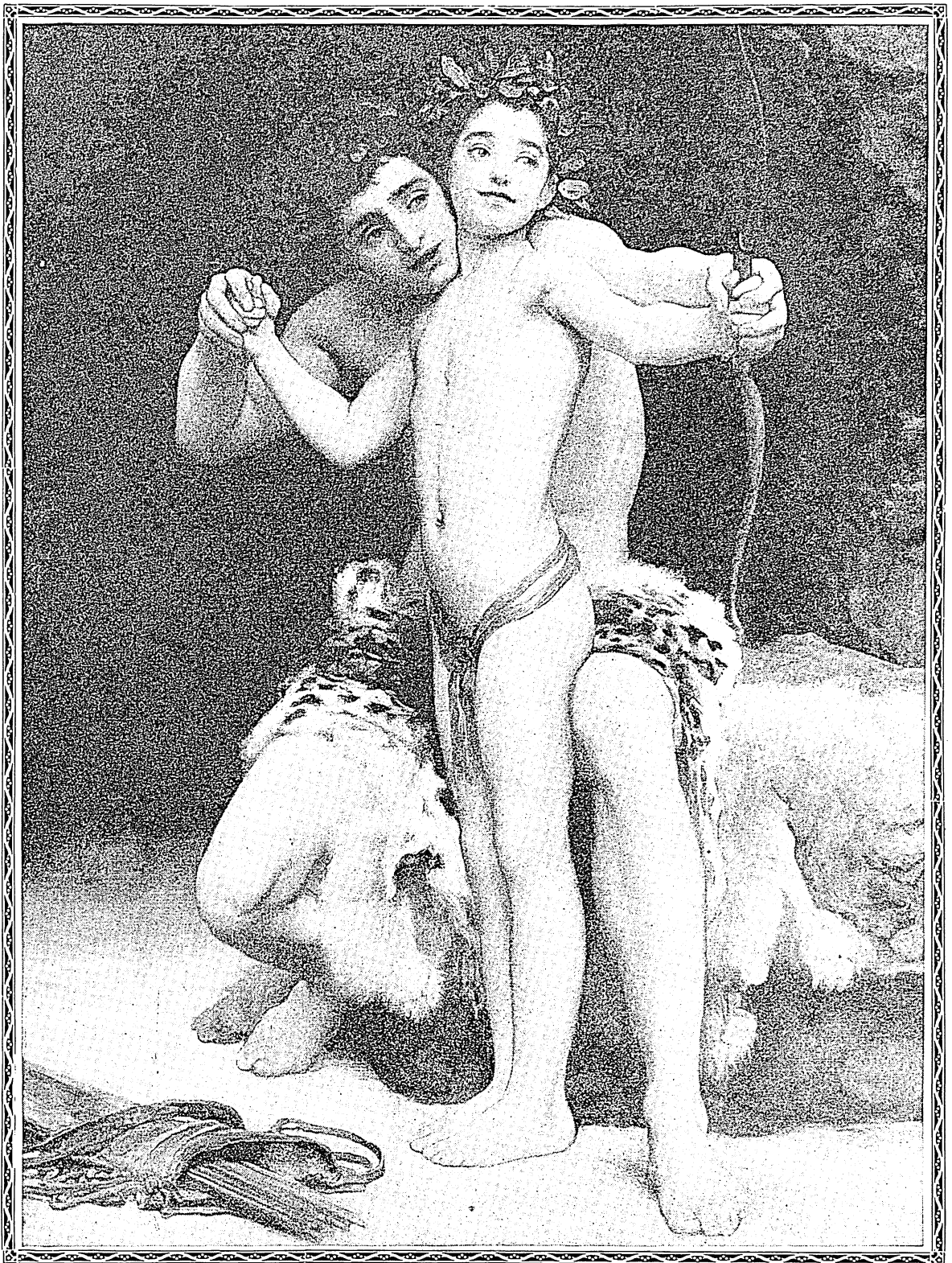
But we must remember that a very large part of the Athenian population were not citizens, for the Athenian state rested on a foundation of slavery. Two-fifths (some authorities say four-fifths) of the population were slaves (often if not usually themselves of Greek blood) whose labor produced a large part of the wealth that gave the citizen the time and money to pursue art and learning and serve the state.

Slavery in Greece was a peculiar institution. When a city was conquered its inhabitants were often sold as slaves. Kidnaping boys and men in "barbarian," that is, non-Greek lands, and even in other Greek states, was another steady source of supply. If a slave was well educated or could be trained to a craft, he was easily disposed of. And a slave always had a chance of obtaining his freedom, for quite frequently his master would let him work for hire and this gave him a chance to save money. After he had bought his freedom or had been set free by a grateful master, he became simply a "metic"—a resident alien. Many of the slaves who could not be trained, however, had a miserable lot. They were sent in gangs to the silver mines at Laurium, where they worked underground by the dim light of little olive oil lamps in narrow corridors.

Life in the Periclean Age

Though the citizens of Athens were thus set free from much of the drudgery of life, we must not get the idea that they reveled in luxury. "Plain living and high thinking" might have been their motto, for the standard of comfort was very low, in comparison with our own. The houses were of sun-dried brick, built two stories high along narrow winding streets, into which refuse was thrown instead of being properly drained or carted off. The people ate two meals a day, each consisting of bread, perhaps a broth of beans and pulse, with wine and sometimes

A YOUNG ATHLETE IN THE MAKING

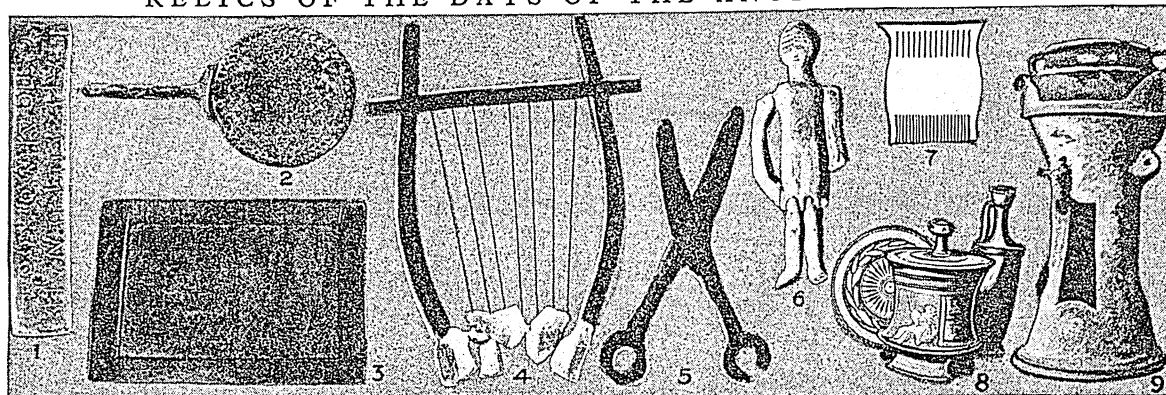


Training of the body occupied just as important a place in the Greek system of education as the training of the mind, and that same fine and gracious character which marked other aspects of their life was also present in their athletic contests and games. This picture by Lord Leighton, former president of the British Royal Academy, shows a young man instructing a boy in the art of shooting with the bow.

fruit to wash it down. Fish with the bread was thought to make a remarkably fine meal. Olives and olive oil were largely used; honey took the place of sugar; and cheese was often eaten in place of meat, but butter was practically unknown. Athens can be

forever broke the power of Athens and left her a mere shadow of her former greatness. Already the first of the inevitable clashes between imperial Athens and her rivals, chief of whom was Sparta, had wasted the strength of most of Greece for 15 years of indecisive

RELICS OF THE DAYS OF THE ANCIENT GREEKS



1. Fragment of pottery on which an Athenian jurymen inscribed his verdict in a court trial. 2. Hand mirror, the reflecting part made of polished metal. 3. Waxed tablet on which some Greek school boy had scratched his multiplication table. 4. Lyre. 5. A pair of scissors. 6. Doll made of clay. 7. Comb. 8. Platter, toilet box, and oil flask. 9. Movable oven with a cooking pot fitting into the top.

nearly as cold in winter as Philadelphia, yet the only heat in the houses was a brazier or dish of burning charcoal. There was no plumbing, nor were there chimneys, and the smoke from the stove in the tiny kitchen sometimes preferred wandering around the house to going out the hole in the roof provided for it. There were no windows on the first floor, but in the center of the house was a broad open court—as you will find in Spain or in the oriental countries today—with the men's apartment, the women's apartment, and the tiny cupboard-like bedrooms clustered about it. The second story sometimes had a window or two looking down upon the street.

The Gossip of the Market Place

But the real life of the city was out of doors. The men spent much of their time talking politics and philosophy in the agora or market place, exercising or lounging in the athletic fields, performing military duty, sitting in the Assembly or the Council of 500, taking part in the numerous state festivals, or doing jury duty—there were 6,000 jurors on duty all the time in Athens, for all the allied cities were forced to bring their cases to Athens for trial. Daily salaries were paid for jury service and service on the Council, which made up a considerable part of the income of the poorer citizens. The women stayed at home, attending to the affairs of the house and spinning and weaving the wool for clothing. They never acted as hostess when their husbands had parties, and were only seen in public at the theater—where they might attend tragedy but not comedy—and at certain religious festivals.

Such was life in Athens in the heyday of her glory, before the jealousy of Sparta and other independent Greek states, and the discontent of the subject states of the Athenian Empire, flamed up into a war that

struggle. This was the first of the Peloponnesian Wars (459–446), which were to the Greek world what the World War of 1914–18 was to our own. In 431, in spite of the exhaustion of both sides, war again broke out.

The plan of Pericles in the Second Peloponnesian War was not to fight at all, but to let Corinth and Sparta spend their money and energies while Athens conserved both. Therefore he had all the inhabitants of Attica come inside the walls of Athens and let the Peloponnesians enter the plain of Attica year after year and ravage as they would, while Athens, again without losses, harried their lands by sea. But Pericles reckoned without the dangers of overcrowding. The plague broke out in Athens and killed one-fourth of the population, including Pericles himself, and left the other three-fourths without spirit and without a leader. After dragging along for ten years, this war ended with the supremacy still undecided.

Alcibiades and His Evil Influence

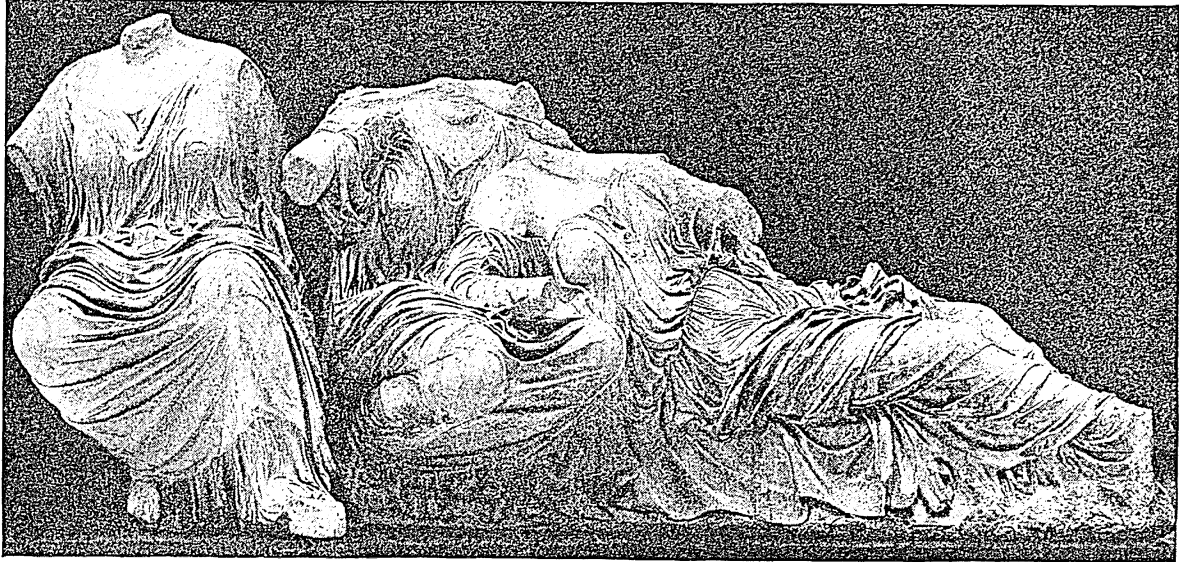
Almost before they knew it, however, the Athenians were whirled by the unscrupulous demagogue Alcibiades, nephew of Pericles, into the Third Peloponnesian War. Wishing for a brilliant military career Alcibiades persuaded Athens into a stupendous expedition against Syracuse, a Corinthian colony in Sicily. The greatness of the Athenian armament reminds us of the Invincible Armada that was sent by Spain against England in Queen Elizabeth's time. And it suffered an equally overwhelming disaster in 413 B.C., being completely destroyed, while the Athenian captives were sold into slavery.

This disaster sealed the fate of Athens. Those of the subjects or allied cities about the Aegean that had remained faithful now deserted to Sparta, and the Spartans laid Athens under siege. In 405 B.C. the

whole remaining Athenian fleet of 180 triremes was captured in the Hellespont at the battle of Aegospotami. Besieged by land and powerless by sea, Athens could neither raise grain nor import it, and in 404 B.C. the Athenian Empire came to an end. The

leadership. Before he could carry his conquests to Asia Minor, however, he was killed and his power fell to his son Alexander, then not quite 20 years old. How Alexander firmly established himself throughout Greece, and then overthrew the vast power of Persia,

CLINGING CLOTH CARVED FROM THE SOLID STONE



These three figures from the ruins of the Parthenon in Athens, and now in the British Museum, are generally supposed to present the finest treatment of drapery known to the sculptor's art. Mutilated as they are, the exact meaning of these figures remains a mystery. They are commonly called "The Three Fates," but another interesting theory is that the reclining form is that of Thalassa "the Sea," lying in the lap of Gaia "the Earth," and that the exquisite flowing lines of drapery represent the waves breaking upon the shore. According to this theory, the figure at the left did not belong to the group.

fortifications and long walls connecting Athens with Piraeus were destroyed, and Athens became a vassal ally of triumphant Sparta.

Sparta maintained its supremacy by keeping Spartan garrisons in many of the Greek cities, and this custom together with Sparta's hatred of democracy made its domination unpopular. After various unsuccessful attempts to shake off its heavy hand, Thebes at length succeeded (*see* Thebes). At the battle of Leuctra in 371 B.C. the Thebans under their gifted commander Epaminondas brought Spartan power to an end. The era of Theban hegemony or leadership was, however, short-lived, for the Theban power was the one-man power of Epaminondas, and when he was killed in the battle of Mantinea in 362 B.C. Thebes really suffered defeat in spite of its victory. The age of the powerful city-states was at an end, and a prostrated Greece invited a conqueror.

Such a conqueror was found in the young and strong country of Macedon, lying just to the north of classical Greece. Its king Philip, who came into power in 360 B.C., had had a Greek education and, seeing the weakness of the disunited cities, made up his mind to possess the Greek world. Demosthenes (*see* Demosthenes) saw the danger that threatened and by a series of fiery speeches against Philip sought to unite the Greeks as they had once been united against Persia. But Philip was too strong for them and at the battle of Chaeronea (338) established his

building up an empire that embraced nearly the entire known world, is told in a separate article.

Alexander made the whole face of the world Greek as he organized his conquests. What he did is a heritage for us to this day, for by imposing the West upon the East he prevented the East's imposing itself upon the West. Greek culture means freedom of spirit, and, as the Romans put it, a healthy mind in a healthy body. The East was a great system of enslavement. Masses of weltering humanity were driven to battle by the lash. They were forced to build palaces under the tropical sun and to make sculptures of prodigious size for the glory of one man, but they took no such joy in any of their work as the Athenians did in their beautiful Acropolis.

The three centuries that follow the death of Alexander are known as the Hellenistic age, for their products were no longer pure Greek, but Greek plus the characteristics of the conquered nations. It was a time of great wealth and splendor. Art, science, and letters flourished and developed. The private citizen no longer lived crudely, but in a beautiful and comfortable house, and many cities adorned themselves with beautiful public buildings and sculptures.

This age came to its end in another conquest—that of Rome. On the field of Cynoscephalae ("dogs' heads"), in Thessaly, the Romans defeated Macedonia in 197 B.C. and gave the Greek cities their freedom as allies. Even so the Greeks caused Rome a great deal

of trouble, and were taught their lesson by the burning of Corinth in 146 B.C. and their reduction to vassalage. Athens alone was revered and allowed a certain amount of freedom, and to its schools went many Romans, Cicero among them.

For more than 2,000 years, from the time of Alexander the Great to the third decade of the 19th century, the Greeks passed from one master to another. The last of these conquerors was Turkey, which established its dominion during the 15th century. At the beginning of the 19th century the power of Turkey was waning. Revolts by subject peoples and by the outlying parts of the empire itself

HOW THE GREEKS DECORATED POTTERY



This is part of the decoration of an ancient Greek vase, pieced together from broken fragments. In this type of work the background was painted black, and the details of the figures sketched in with black lines, while the remainder was simply left in the color of the clay. The delicacy and sureness of line on these vases is universally admired.

became more and more frequent. In 1821 the Greek nation as a whole, stirred by the example of the French Revolution, rose in arms in the Greek War of Independence. Russia was interested because the Greek Catholic church was also the state church of Russia, and Russia had for years claimed the right to protect the Greek Christian subjects of the Turkish Empire. Numerous volunteers from Europe joined the Greeks—Lord Byron among them—and fought the troops of the sultan with varying success. There were terrible massacres committed on both sides. In 1827 the Turkish fleet was destroyed at Navarino by the combined British, French, and Russian fleets, but there the joint action ceased. Next year Russia took matters into her own hands, marched an army into the Balkans, and took Adrianople. In the peace of Adrianople (1829) Turkey signed a peace whose outcome was the restoration of independence to the Greeks, after centuries of oppression by foreign powers.

In 1832 after serious disorders and the murder of its provisional president, the three protecting powers raised to the throne of Greece Prince Otto, son of Louis I of Bavaria. Otto, however, ruled after the German manner, with German advisers, and the Greeks in 1862 revolted and deposed him. In the following year Prince George of Denmark became king and reigned until his assassination in 1913. In 1864 Great Britain ceded to Greece the Ionian Islands, which had been a republic under British protection since 1815. The scantied original kingdom was further enlarged by the addition of Thessaly on the north, between 1881 and 1897. Crete, which had

revolted from Turkish rule, was not allowed by the powers to become a part of Greece until 1913. Brigandage was not put down until 1870, and it was not until 1916 that the 56-mile link was completed that now connects the Greek railways with those of the rest of Europe.

In the Balkan War of 1912-13, the allied Balkan states thoroughly defeated Turkey, and Greece gained a broad strip of territory on the north, amounting to 21,000 square miles and including a great part of ancient Macedonia (*see* Balkan Peninsula). This was the greatest expansion the kingdom had experienced since its founding in 1862. In the World War of 1914-18 Greece proclaimed neutrality; but King Constantine, who was married to the sister of Emperor William II of Germany, was accused by the Allies of secretly aiding the Central Powers. Prime Minister Venizelos, a most brilliant statesman who had piloted his country through the Balkan Wars, revolted after he had twice been dismissed unconstitutionally by the king; and in June 1917, King Constantine was forced by the Allies to abdicate in favor of his second son, Alexander, and leave the country. (*See* World War of 1914-18.)

In the peace settlement Venizelos obtained much new territory for Greece, including Eastern Thrace, Smyrna, and a large adjacent district in Asia Minor. But in December 1920, after the death of Alexander from the bite of a pet monkey, the Greeks defied the Allies by restoring Constantine to the throne. The Allies therefore declined to support the Greeks in enforcing their new claims in Asia Minor, claims which in fact exceeded those promised in the peace settlement.

The Greeks rashly advanced alone upon the Turks, and were overwhelmingly routed. Smyrna was burned, and Greece was filled with fugitives. But this flight was as nothing compared to the invasion of refugees that was to come. By the terms of the Treaty of Lausanne (1923) the Greeks not only lost Eastern Thrace and all claims in Asia Minor, but the Turks insisted that all Greek Christians in Turkey and all Moslems in Greece (the exceptions were few) must be returned to their own countries, even though they and their families had been living abroad for centuries. This meant that 1,300,000 Greeks came home from

SHEPHERDS STILL LEAD FLOCKS ON GRECIAN HILLS



Under his big wool cape, wind-proof and rain-proof, this Greek shepherd wears a gray homespun "fustanella," or short kilt-like skirt. On holidays the kilt is white and pleated like a dancer's! He is proud of his attire, and always looks neat and clean.

Turkey, several hundred thousand Armenians also fled to Greece in fear of their persecutors, and about 353,000 Moslems returned to Turkey. Although this uprooting of some two million people was accompanied by great suffering, the newcomers, who were mostly skilled farmers, tobacco-raisers, weavers, and perfume-makers, brought new life to the regions they settled.

Disturbances continued in Greek politics. The restored King Constantine was again forced to abdicate (1922). His son, King George II, reigned until 1924. Then Greece became a republic. Economic difficulties beset the young republic and resulted in a series of dictatorial governments. For four years, 1928-32, Venizelos as premier provided a measure of peace. In 1935 he supported a revolt against the pro-royalist government, but was defeated and forced to flee (see Venizelos, Eleutherios). A monarchy was then proclaimed, and King George II returned to the throne. In April 1936 Gen. John Metaxas became premier, and he ruled as dictator until his death in 1941.

When Greece in October 1940 refused Italian demands, Italy, allied with Germany in a war against England, invaded the country from Albania. The Greeks routed the invaders and drove into Albania. But when the Germans attacked in April 1941, Greek resistance crumbled, despite British military aid, and the country was occupied. (See also World War, Second.)

A Visit to the Greece of Today

And now let us make a flying visit to this historic land. Should you take a walking trip through Greece you will find, outside of Athens, few comfortable hotels. After an afternoon's tramp over stony roads, you will perhaps stop at some *khan*, and find that the cooking is done at the hearth before which you will roll yourself up in a blanket to sleep. At such country inns you will not find the delicious Greek-Turkish cookery of Athens—*pilaf*, which is rice prepared with minced mutton or chicken and pastry made with honey. You will be lucky to get coarse dark bread and goat's milk cheese, and a few preserved olives, washed down with the native wine

which tastes strongly of the resin put in to preserve it.

An hour or so by train from Athens will take you to the mines at Laurium, from which came the silver to pay for Themistocles' "wooden wall"—the fleet which made Athens head of an empire. A Greek and a French company are working these mines today and a guide will take you through some of the 2,000 ancient galleries. The old slag heaps are being smelted over for lead and other metals that the ancient Greeks failed to extract.

Of Thebes and Corinth, the ancient neighbors and rivals of Athens, and of Sparta, the more distant enemy city, the earthquakes and other accidents of 2,000 years have left little now standing. Thebes is now just a country town. It is surrounded by mountains, with the famous Helicon and Parnassus on the west. To the northwest lies Lake Copais, formerly an unhealthy sheet of water and marsh, but now drained to make 60,000 acres of fertile land.

The Famous Currant Industry

The most interesting excavations in Greece are in the Peloponnesus at Olympia, which may be reached by railroad from Corinth. As you journey along the Gulf of Corinth you will see luxuriant vineyards and dazzling white fields set apart for drying currants. Tall dark cypresses and mountain torrents add to the beauty of the landscape. The currant industry became so profitable in the late 1870's when phylloxera attacked the vines of France that Greek agriculturists cut down their precious olive groves—it takes 30 years for an olive tree to reach maturity—in order that they might plant more currants. And ever since the French vines recovered, the Greek government has had the problem of superfluous currants to deal with. At first the government took over a percentage of the crop, but later it passed a law limiting production and ordering the digging up of thousands of acres of vines.

Olympia, like Pompeii, is a buried city which modern enterprise has brought to light. In the three centuries following the last celebration of the Olympic

Games, in the 4th century A.D., the chief temples were overthrown by earthquakes, the treasuries were covered by a landslip, and the whole site buried under two or three layers of sand by the two rivers at whose junction it lies. In the museum there you will find the original Hermes of Praxiteles, one of the greatest pieces of ancient sculpture that has come down to us.

Other important finds have been made at Delphi, once the site of the famous oracle (*see* Delphi). You will enjoy a visit to this beautiful spot on the northern shore of the Corinthian gulf, whose cold springs and cool air currents from the chasms of Mount Parnassus early excited the awe of the Greeks. You will be disappointed, however, if you have come with an old guide book, for the Castalian spring was filled up by an earthquake in 1894.

A visit to the little island of Aegina about 15 miles southwest of Athens will also be well worth while. This has a prosperous agricultural and fishing community, famous for its pottery, and for the sponge fishing carried on by divers in the spring and summer. But it is most interesting for the remains of its splendid temple of Zeus.

Some day when the Aegean Sea is propitious you will sail from the Piraeus to visit the Cyclades Islands, especially Delos. This little island, uninhabited today except by a few shepherds and the custodian of the excavations, is rich in archaeological interest—temples, a theater, and a house with a mosaic floor, and the fragments of a very old colossal statue of Apollo which stood in the sacred precinct near the Apollo temple, in the days of the Delian League. If you climb to the top of Mount Kynthos you can see other islands of the group round about, including Naxos, the largest and most fertile, and Paros, still famous for its marble.

Relics of Many Ages

Side by side with the antiquities of Greece you will often find Byzantine churches, medieval monasteries of the Greek Catholic church, and ruins of "Frankish" castles, erected in the days following the crusade of 1204, when barons from western Europe ruled parts of the land. In 1829 some 300 of the smaller monasteries were suppressed and their buildings allowed to fall into decay. But there are still scores of monasteries in Greece, and in traveling about you will often seek the hospitality of the monks instead of putting up at doubtful khans—even in Saloniki, the "queen city of the Aegean" (*see* Saloniki). The monasteries of the mountainous promontory of Athos are world famous, and the Meteora in Thessaly the most curious. The visitor is usually swung up the top of these rocky pinnacles by a basket and windlass, instead of being asked to climb the dizzy ladders.

The Greek Orthodox church, although nominally under the Patriarchate of Constantinople, is really a free national church. Its growing separation from the Roman Catholic church, arising in part from differences of language and civilization, became

definite in 1054. Aside from the refusal of the Greek church to recognize the supremacy of the pope, there are other differences—marriage allowed to Greek priests. (forbidden to Roman Catholic clergy), use of leavened instead of unleavened bread in the sacrament of the Mass, a slight difference of doctrine concerning the Holy Ghost, etc.

The Greeks today are a scattered race, like the Jews; but in whatever part of the globe they may be they show an intense love of Greece. In one battle in the Balkan War 7,000 Greeks who were American citizens died fighting against the Bulgars; and it is the usual ideal of the Greeks whom we see in the United States in their little fruit, flower, and candy shops to make a sufficient fortune to enable them to go back to Greece to live.

Races of Modern Greece

In addition to the Greek-speaking element of the population, which represents the parent Greek stock much modified by Slavic and other racial mixtures, Greece today is inhabited by two other wholly distinct racial groups. All over the Attic plain, Corinthia, Argolis, and in various other parts, are found the Albanians, who are chiefly farmers. They are a vigorous and manly race, who make excellent soldiers and sailors and have furnished many famous leaders to the kingdom, though they are less quick-witted than the true Greeks (*see* Albania). The Vlachs, who are found chiefly in the mountains of Thessaly and central Greece, are for the most part nomad herdsmen or carriers; descended from the Latinized population of Roman times, they still speak a language which indicates its Latin origin.

More than half the people are employed in agriculture and kindred pursuits. Owing to the destruction of the forests, and the consequent denudation of the soil and impoverishment of water supply, the arable area is considerably less than in classical times. Where there is sufficient natural water, or where irrigation is practiced, however, bountiful crops are raised. More than half the arable area is devoted to stock-raising, chiefly sheep and goats, as of old. One-fifth of the surface of the mainland is still forested. Methods of agriculture are still for the most part of the most primitive kind. In many places the old wooden plow—precisely as it was 2,500 years ago—is still employed. The use of fertilizers and rotation of crops is rare, and the fields are generally allowed to lie fallow in alternate years. The result is that Greece has to import a considerable proportion of its food, especially cereals.

The absence of good native coal has retarded manufacturing, though textiles, leather goods, soap, paper, glass, and some other articles are manufactured, in addition to olive oil and wine. Shipbuilding is carried on at all the ports, for a large part of the nation's wealth today comes from its carrying trade. The Greeks are shrewd traders and monopolize a considerable proportion of the commerce of the Mediterranean region.

The GLORIOUS ART of GREECE and How ROME Helped Transmit It to Us

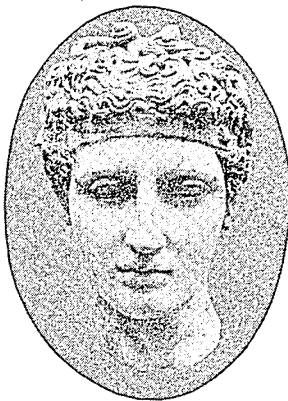
GREEK AND ROMAN ART. Greek art owes a great deal to natural conditions. Greece is one of the fairest lands in all the world; nowhere else has Nature brought together the charm of mountains and sea and sky in more beautiful combination. The firm lines of mountains and crags outlined in the crystal-clear air against the brilliant blue of the sky must have helped to inspire that love of simple graceful line, of perfect proportion and symmetry, of strength and serenity, which is characteristic of Greek architecture and sculpture.

Responding to the beauty that was everywhere about him, the Greek aspired to make his mind and his body harmonious and beautiful as Nature. It is impossible to measure how much the sculptor owed to the Greek emphasis of physical culture and athletics. And Nature endowed the Greeks in another important way; for many of the islands off the coast, notably Paros, are almost solid blocks of white marble, while in Attica the quarries of Mount Pentelicus and Mount Hymettus

also yield an abundance of the beautiful white stone which invites the sculptor's chisel.

But we must not think that cold white marble alone satisfied the Greeks. They used color in both their sculpture and their architecture, though time has almost entirely washed away the reds and blues and other bright hues with which they touched up their work, and we can only imagine what the effect must have been when those works were in their prime. The work of the great Greek painters also has disappeared, and lives only in what the ancient writers tell us about it and in the work of their disciples of a later day. Polygnotus in the 5th century, we are told, was renowned as a draughtsman; while the great painters of the 4th century—Parrhasius, Zeuxis, and Apelles—were famous as colorists.

Fortunately many Greek vases have been preserved in tombs and in other sites uncovered by modern excavators. Simple and graceful in form, these vases show in the earliest specimens geometric designs; then figures of men and gods, painted in black against



the natural red of the clay, or, as later became more common, with the figures left red against a black background. From these vases we are able to form some idea of what Greek painting was like, and they give us further examples of that wonderful feeling for form and line which made the Greeks supreme in the field of sculpture.

We must not imagine that Greek art sprang fullblown into being. The ancestors of those artists who were to create the most perfect forms of sculpture that the world has ever seen were a semi-barbarous people,

when they began to migrate into the peninsula that is now Greece; and centuries rolled by before their genius flowered into the art forms which have been the admiration of all later times. Though they must unconsciously have been influenced by the art of the Aegean peoples whom they overwhelmed, no relation can be traced between the well-wrought figures and reliefs of Tiryns and Mycenae and Cnossus, and the crude beginnings of Hellenic sculpture in the 7th century B.C. When

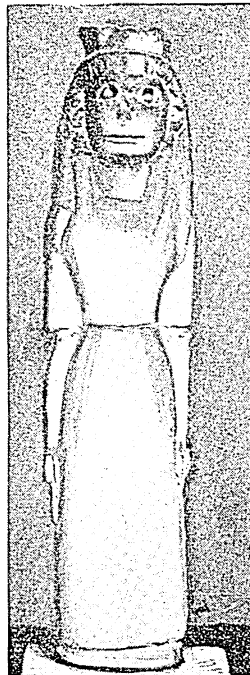
THE poet tells us that "A thing of beauty is a joy forever." More than 20 centuries ago the ancient Greeks, inspired by lofty ideals of Beauty, Truth, and Goodness, which in their simple and harmonious view of life were inseparable, created works of art which have never been equaled. Worn and defaced by time, these art works are still so beautiful that to look upon them is an inspiration. Many men have spent the best part of their lives searching for these beautiful fragments and thus helping to piece out the story of Greek art. Something of this wonderful story—the conditions under which Greek art was born, its development, and the great masters and their work—is told in this article. It tells, too, how when Greece fell her beauty held captive the practical-minded Roman conquerors; how, under her influence, the Romans developed an art of their own, and also helped to transmit to later ages the unsurpassed glory of the art of the Greeks.

we see how primitive and stiff are the Greek statues of that archaic period, and compare them with the masterpieces of two centuries later, we cannot but marvel at the rapid development of Greek art, when once it got fairly under way. Through the Phoenicians, the great trafficking race of the age, the early Greeks came in contact with the art of Babylonia, Assyria, and Egypt. They borrowed many of their decorative forms from these peoples, but transformed them by the fires of their own superb powers.

Greek religion, Greek love of beauty, and a growing spirit of nationality were finding fuller and fuller expression. But it took a storm like the Persian invasion (490–479 B.C.) to arouse the young virile race to great achievements. Having driven out the Asiatic invader, the Greeks suddenly grew, in the 5th century, to full stature. What the Persians had destroyed the Greeks set to work to rebuild. Their poets sang the glories of the new epoch, and Greek genius, as shown in the great creations at Athens,

came to full strength and beauty. It was then, under Pericles, the great statesman and patron of art, that the Athenian Acropolis was restored and adorned with the matchless Parthenon, the Erechtheum, and other beautiful buildings. (See Acropolis; Athens.)

AN ANCESTOR OF THE
VENUS DE MILO



This quaint old lady is an example of very early Greek sculpture. It is hard to realize that from such crude beginnings developed the art which created the Venus de Milo.

There were beautiful temples in other cities of Greece, too, notably that of Zeus at Olympia, which we know from descriptions by the ancient writers and from a few fragments that have been discovered in recent times. (For Greek architecture see Architecture.)

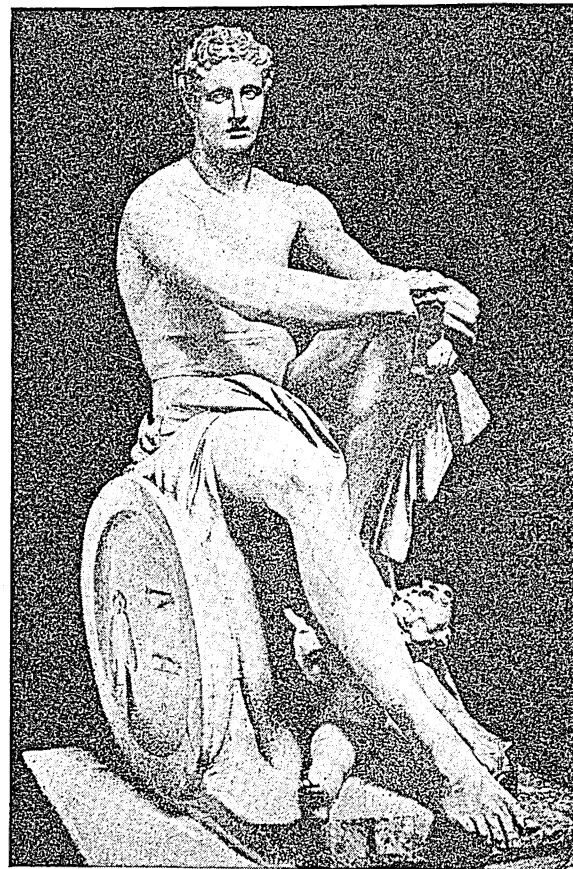
The 5th century was made illustrious in sculpture also by the work of three great masters, all known to us in some degree by surviving works. Myron is famous for the boldness with which he fixed moments of violent action in bronze, as in his famous 'Discobolus', or Discus-Thrower, which we know through a fine copy now in Munich. The 'Doryphorus', or Spear-Bearer, of Polyclitus, who also worked in bronze, was called by the ancients the Rule, or guide in composition, because it was believed to follow the true proportions of the human body more perfectly than any other work.

But the greatest name in Greek sculpture is that of Phidias, who expressed in his marvelous works the noblest and loftiest ideals of Greek religion (see Phidias). It was under his direction that the sculptures decorating the Parthenon were planned and executed, and some of them may have been the work of his own hand. His great masterpieces, the colossal gold and ivory statue of Athena, which stood within this temple, and the similar one of Zeus in the temple at Olympia, have disappeared. But we can form some conception of his great genius from the remains of the sculptures of the pediments and frieze of the Parthenon, now preserved in the British Museum and known as the Elgin Marbles, from Lord Elgin who brought them from Athens in 1801-12. These sculptures, in their composition, in their exquisite modeling, and in the noble ideas which they embody, are the greatest works of Greek art that have come down to us. Another famous work that is believed to belong to the school of Phidias is the 'Aphrodite' of Melos, commonly known as the Venus de Milo, a marble statue now in the Louvre in Paris. Although some think it belongs to a later date, its perfect proportions, its calm dignity, and noble serenity typify the qualities which we associate with Phidias.

portions, its calm dignity, and noble serenity typify the qualities which we associate with Phidias.

Phidias was followed by Praxiteles, Scopas, and Lysippus. Of Praxiteles, who has been called "the sculptor of the beautiful," we have an original work, the statue of 'Hermes with the Child Dionysus', the only existing statue which we know certainly to be the work of one of the great Greek masters. Most of the sculptors, it must be remembered, are known to us only through copies of their work by Roman artists. The figure of Hermes, at once strong and active and graceful, beautifully proportioned, with a surface of exquisite texture, the well-poised head and the face expressive of nobility and sweetness, is beautiful beyond description. The child which is

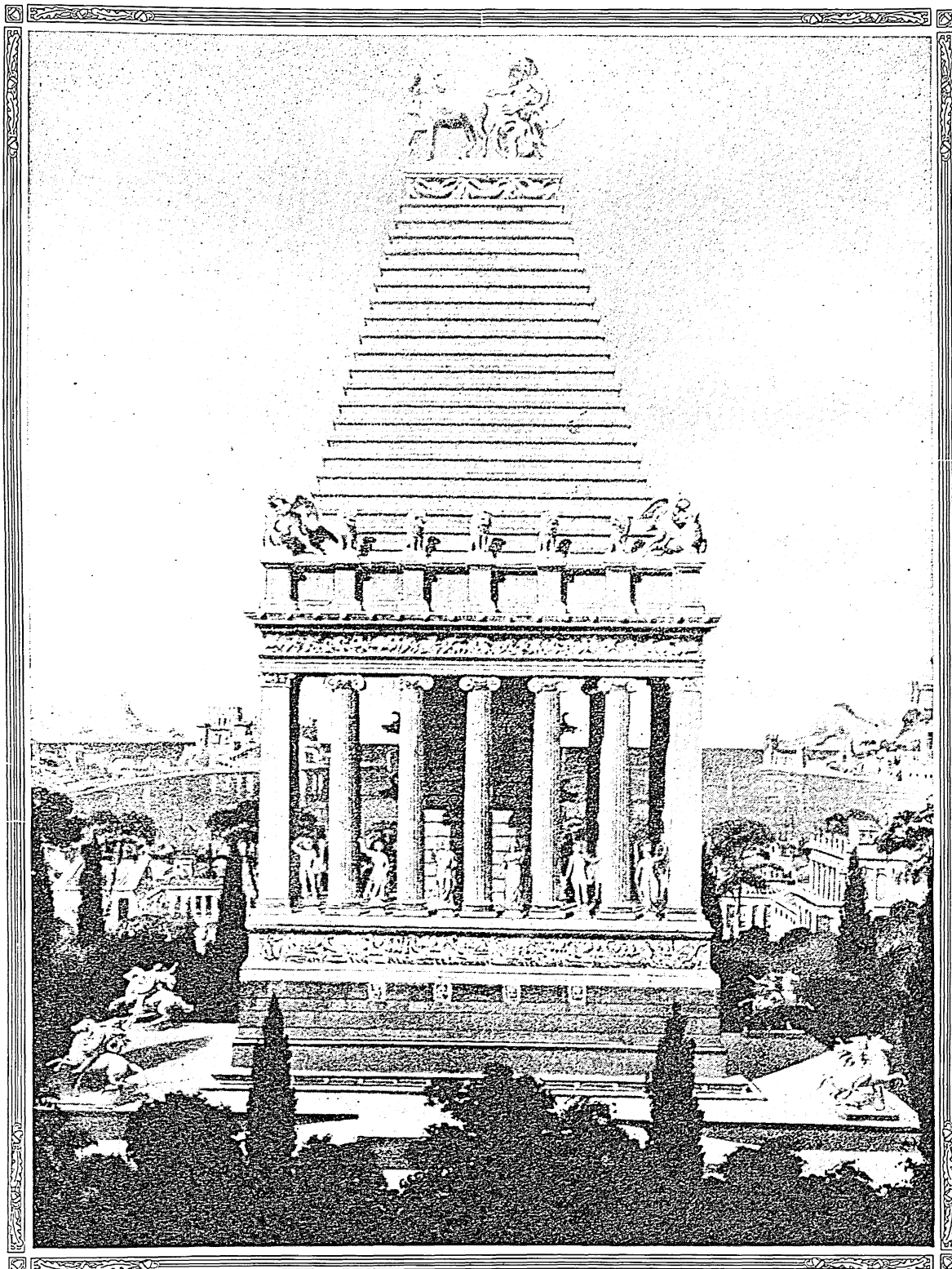
THE GOD OF WAR AT REST



Compare this wonderful statue of the god Ares (Mars) with the crude figure at the left, and you will appreciate what progress the Greeks made in art in the course of a few centuries. This statue, the famous 'Villa Ludovisi Mars', is believed to be a copy of an original by Scopas or Lysippus. It is an excellent example of the characteristic "restraint" of Greek art. To show the violent character of the God of War, the sculptor merely extended the breadth of his nostrils, as men dilate them in anger. Playing at his feet is the little God of Love.

held in the left hand is reaching out to grasp something, perhaps a bunch of grapes—held in the missing hand of Hermes. The so-called Satyr or Faun of Praxiteles, which suggested Hawthorne's 'Marble Faun', is probably the work of another sculptor of

THE MOST FAMOUS TOMB OF ANCIENT TIMES



Whenever we say "mausoleum," we should think of King Mausolus of Caria, who died 353 B.C. His wife Artemisia built a tomb for him at Halicarnassus which was so magnificent that the ancients reckoned it as one of the Seven Wonders of the World. It was designed by the finest architects and decorated by the greatest sculptors of the time. It remained almost intact until the 12th century of our era when the Crusaders began to use it as a quarry for their fortifications. This picture shows one of the various attempts that have been made to show how it probably looked. (See Seven Wonders of the World.)

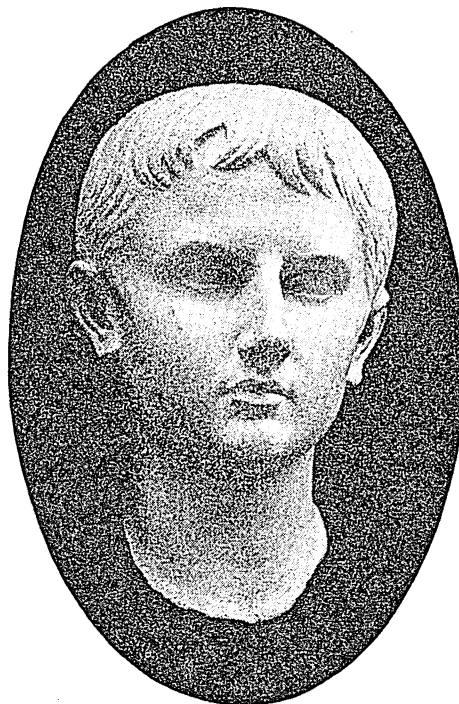
FIGURES FROM THE WEST FRIEZE OF THE PARTHENON



Greek Art reached its climax in the Parthenon. Here we see three of the figures in the frieze on the west front, where the great "Panathenaic Procession" is represented as starting. Here the young soldiers are mounting or preparing to mount, one of them stooping to fasten his sandal. Notice the spirited action of these classic steeds of stone. The Greeks did not think it appropriate for horses to walk quietly in a procession. To do justice to the occasion they felt horses should prance and rear.

the same school. Praxiteles' conceptions are less lofty and dignified than those of Phidias, but they are full of grace and charm. Scopas carried further the tendency to portray dramatic moods, giving his subjects an intense impassioned expression. Lysippus returned to the athletic type of Polyclitus, but made his figures lighter and more slender, combining manly beauty and strength. He was at the height of his fame in the time of Alexander the Great, who, it is said, desired that Lysippus only should portray him. How far this age had advanced in the expression of graceful motion through the modeling of the figure and the skilful handling of the drapery can be seen in the celebrated 'Winged Victory' of Samothrace, now in the Louvre.

As time went on, Greek art lost much of its simplicity and ideal perfection of form, its serenity and restraint, but it gained in intensity of feeling, in expressing physical suffering and anguish. It had also become more realistic, portraying not only ideal types of men and gods but portraits of individuals, and not



THE YOUNG AUGUSTUS

A fine example of Roman portrait sculpture

only Greeks but barbarians as well. One of the most famous works of the period after the death of Alexander is the 'Dying Gaul' sometimes called the 'Dying Gladiator'. In the 'Laocoön' group, which depicts the father and his sons crushed to death by deadly serpents, we find the extremity of physical torture as represented in sculpture. To this period belongs also the famous 'Apollo Belvedere', a statue of very great beauty, though it has lost something of the vigor and the calm power of the more heroic days. (For picture, see Apollo.)

The Art of the Romans

From early times the Romans had felt the artistic influence of Greece, and when in 146 B.C. Greece was finally conquered by Rome, Greek art became inseparably interwoven with that of Rome. "Greece, conquered, led her conqueror captive"—this is the poet's way of expressing the triumph of Greek over Roman culture. But it is a mistake to suppose that the Romans were merely imitators, or that Roman art was merely a decayed form into which Greek art had fallen.

To a large extent the art of the Romans was a development of that of their predecessors in Italy, the Etruscans, who, to be sure, had learned much from the Greeks (*see Etruscans*). Nor were the Romans themselves entirely without originality. Though their artistic forms were, for the most part, borrowed, they expressed in them, especially in their architecture, their own practical dominating spirit, as you may read in the article on Architecture.

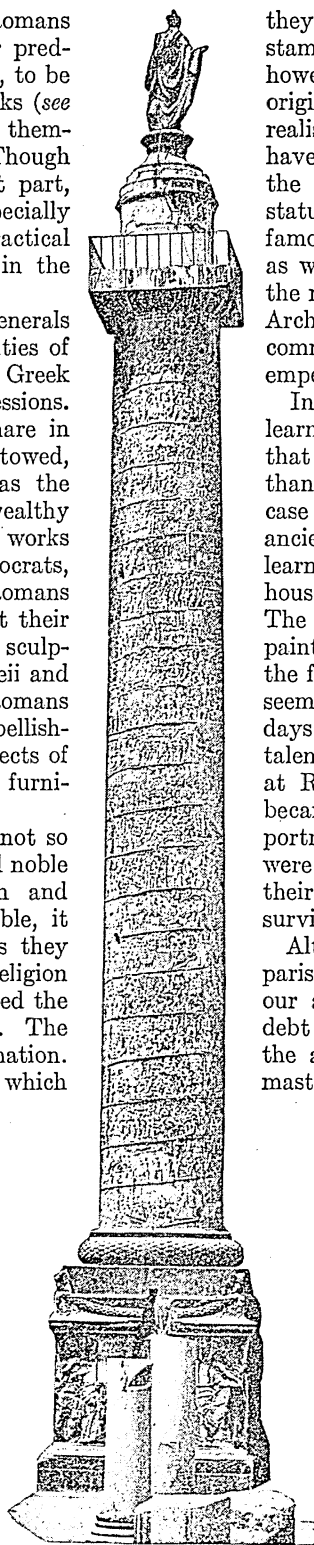
In the 2d century B.C. the Roman generals began a systematic plunder of the cities of Greece, bringing back thousands of Greek statues to grace their triumphal processions. Greek artists flocked to Rome to share in the patronage that was so lavishly bestowed, owing to the rich conquests made as the Roman power was extended. The wealthy Romans built villas, filled them with works of art in the manner of our modern plutocrats, and called for Greek artists or Romans inspired by Greek traditions to paint their walls and decorate their courts with sculptures. The ruins excavated at Pompeii and Herculaneum show us how fond the Romans and their neighbors in Italy were of embellishing not only their houses, but the objects of daily use, such as household utensils, furniture, etc. (*see Pompeii*).

But with the Romans art was used not so much for the expression of great and noble ideas and emotions as for decoration and ostentation. As art became fashionable, it lost much of its spiritual quality. As they borrowed many elements of their religion from the Greeks, so the Romans copied the statues of Greek gods and goddesses. The Romans were lacking in great imagination. Even in one of the few ideal types which

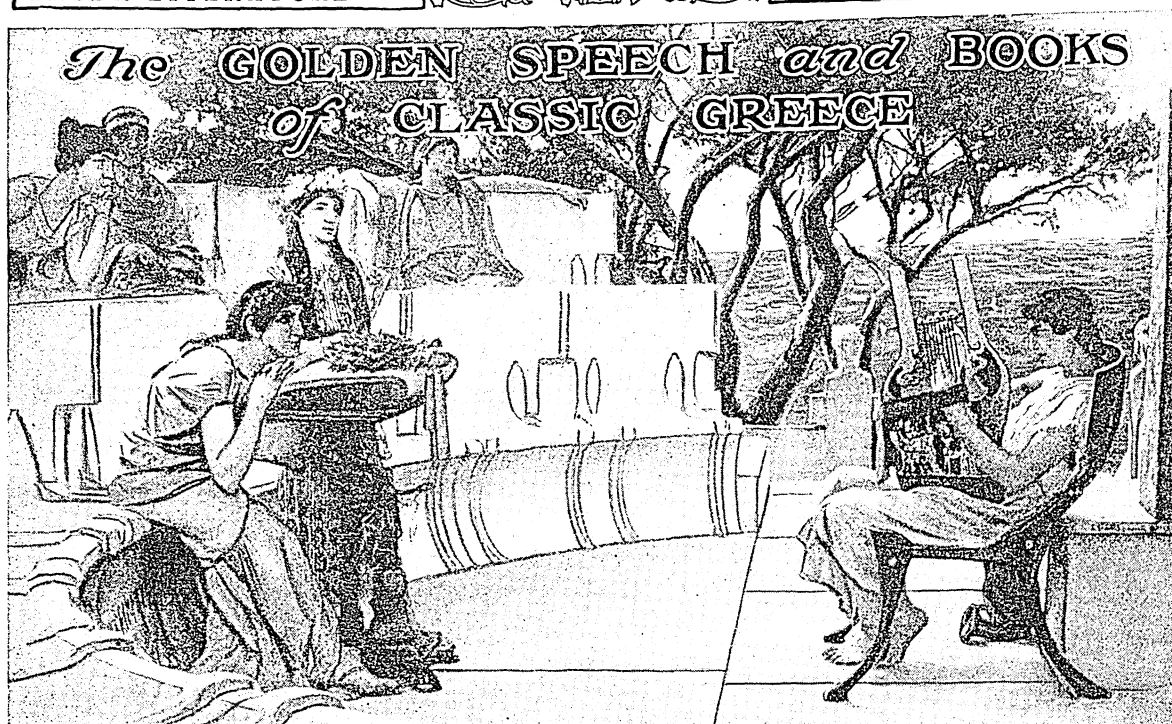
they originated, the 'Antinoös', the Greek stamp is unmistakable. In one respect, however, the Roman sculptors did show originality; they produced many vigorous realistic portrait statues. Among those that have come down to us are a beautiful bust of the young Augustus, a splendid full-length statue of the same emperor, and busts of other famous statesmen. All these have a historic as well as an artistic value. So, too, have the reliefs which adorn such structures as the Arch of Titus and the Column of Trajan, commemorating great events in these emperors' reigns.

In painting—though here, too, they learned from the Greeks—it seems probable that the Romans developed more originality than in sculpture. Unfortunately, as in the case of the Greeks, the great masterpieces of ancient painting no longer exist; but we can learn much from the mural paintings found in houses at Pompeii, Herculaneum, and Rome. The pleasing coloring, which in many of the paintings still remains fresh and vivid, and the freedom and vigor of the drawing, would seem to indicate that even from these ancient days Italy was the home of painters of great talent. Portrait painting especially flourished at Rome, where hack street-corner artists became so common that one could have his portrait painted for a few cents. These were more remarkable for their realistic than their artistic merit, as we know from several surviving examples.

Although the art of Rome loses in comparison with that of Greece, still it commands our admiration, and we owe the Romans a debt of gratitude for helping to transmit to us the art of the Greeks, who were their great masters.



Trajan's Column is at once a sublime expression of Roman Art and of the dominating force of the conquerors of the World. If you should go to Rome one of these days, you will see it towering into the air nearly a hundred feet high. Running around the shaft spirally in 23 tiers are some 25,000 figures done in relief. They represent the victories of the emperor Trajan. Portions of this relief are shown on each side of our picture. Under this column, in a golden urn, the ashes of the Emperor were buried. On the summit there was originally a colossal bronze statue of him, which Pope Sixtus V replaced with the figure of St. Peter.



Typical of the spirit of Greece is this painting, by Alma-Tadema, showing the poet Sappho, seated at the left, listening to the music of a lyre. The beauty of the fragments which we have of her work fully justifies the esteem in which the Greeks held her.

GREEK LANGUAGE AND LITERATURE. If Solon and Pericles could wander back from the Elysian Fields and sit down in some café of modern Athens they would probably be surprised to find how easily they could read the morning paper. Of course, it would take them a minute to focus their eyes on the print, so much smaller than anything done with the reed pen of their day, and they would find the shape of some of the letters changed or standardized. They would find many new words, and perhaps they would accuse the journalist of careless grammar. But all the same the literary Greek of today is perfectly intelligible to anyone who knows his Greek of 2,500 years ago. Their greatest trouble would be in ordering breakfast and talking with people about them. For many words concerning the intimate things of daily life were borrowed during medieval and modern times from the Italians, Turks, or other neighbors, and the pronunciation is so changed as to make modern spoken Greek almost unintelligible to one acquainted with only the classical tongue.

Greek nevertheless should be considered not as a dead language but as a living one. The Greek school-boy can read the literary masterpieces of 2,500 years ago far more easily than we can read Chaucer. And the Greek language is living not only among modern Greeks, but in the up-to-date speech of America and the rest of the world. When we want to make a new word for a new thing we are likely to borrow from the Greek. For example, "osteopathy," "phonograph," "telegraph," "telephone," "automobile,"

"periscope," "photograph," and scores of other words that have found their way into our dictionaries to name modern inventions and developments of science are formed directly from old Greek words. Nor are we indebted to Greek only for these "made" words. Many are also woven into the very warp and woof of our language, as is told in the article on English Language. So, if you know Greek, you can often see at a glance the meaning and pronunciation of a word that would otherwise make you gasp—"anthropomorphic," for instance, which comes from the Greek words for "man" and "form," meaning therefore "man-formed" or "manlike."

But even if Greek were as dead as Sanskrit from the viewpoint of modern life, still it would be worth while for us to study it. For of all the languages of the world, the most beautiful is Greek as it was written 20 centuries or more ago. It was graceful and harmonious, full of light and shade and color, subtlety and music. It could pile words together into compounds with as great abandon as German does nowadays—only the words were prettier to begin with—or it could sail along with little words like a lightly moving skiff.

Moreover in this superb tongue was written one of the most wonderful literatures of all time. Of this literature we can only get half an idea even through the most careful translations. Poetry is always hard to translate, but Greek poetry loses more than perhaps any other, since English often takes two or three times as many words to say the same thing. A prose

translation of Homer is therefore clumsy, and a translation in English verse is inadequate. Neither gives any idea of the simplicity and resonance and movement, the inevitability which never becomes monotony. The lyrics are even harder to translate, though Swinburne and Tennyson have produced free renderings of great beauty which give the English reader some notion of the qualities of the originals.

Greek prose also loses much by translation, for Greek is a so much subtler instrument of expression than English that you would need a footnote to almost every word of a translation to explain the exact shade of meaning that your Greek author intended. The Greek "particles", for instance, little words only a letter or two long and amounting only to a slight gesture of the hand or the flicker of expression on a person's face, must be translated in English by some such awkward word as "moreover." A translation makes things tedious where the Greek expresses them compactly. This of course is because Greek is a rather highly "inflected" language. A single word of perhaps no more than two syllables, in Greek, may become a whole sentence with us.

The oldest Greek literary works that we have are the 'Iliad' and the 'Odyssey' of Homer, which the world still acknowledges as the most splendid examples of epic or narrative poetry. People used to wonder how first poems could be so perfect and so great as the 'Iliad' and the 'Odyssey'. The explanation is of course that these were not the first poems. They come from an age that was already rich in "folk" poetry—hymns to the gods and marriage hymns and lays telling the deeds of ancient heroes. In that age, however, the Greeks had no writing and of all the

songs that the wandering bards carried from city to city and recited from memory, only the Homeric poems survived to be written down. The only exceptions are a few of the so-called Homeric hymns—the invocations to Apollo or some other god, with which it was customary for the singer to prelude his recitation of the Homeric stories themselves. The article

on Homer tells you about these thrilling tales of adventure and also indicates where in these volumes you may find some of these stories retold.

From a slightly later period we have the poems attributed to Hesiod. Hesiod is a much more definite figure than Homer. He lived at the wretched hamlet of Ascra near Mount Helicon in Boeotia, probably in the 8th century B.C., and drew many faithful pictures of the dull poverty-stricken country life he knew so well. Homer and Hesiod together made a sort of bible for the Greeks—Homer telling the story of the heroic past, and Hesiod dealing with the practical realities of daily life, setting forth homely maxims and precepts for

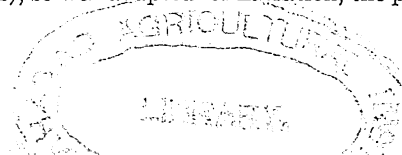
the farmer in his 'Works and Days', and in the 'Theogony' piecing together the old legends to form a systematic account of creation and the gods.

With the 8th and 7th centuries we come to the beginnings of the historical period. The old ways of life were giving way to new. Commerce, discovery, colonization, political change, widened the horizon of the Greeks and quickened their feeling and imagination. To express the thoughts and feelings aroused by this fuller and more interesting life, new literary forms were invented—all still in verse, however, for prose had not begun to be used as a literary medium. Instead of the rapid flowing "hexameter" (a line of six measures), so well adapted for narration, the poets

A SCENE FROM GREEK TRAGEDY



This painting by a modern German artist interprets a moving scene in the play 'Oedipus at Colonus', written by that mighty tragic poet, Sophocles. The blind old Oedipus, formerly king of Thebes, but now a wanderer on the face of the earth, has just addressed to his daughter Antigone the opening line of the tragedy, "Child of a blind old man, Antigone, what country reach we?"



of the 8th and 7th centuries used the meter called "elegiac," which lent itself to direct self-expression on almost any theme—patriotism, war, mourning, or political reflection—and the "iambic" meter, which was especially adapted to pointed personal utterance, usually of a satirical nature. With these forms are associated such names as Archilochus, Mimnermus, and Solon, the great lawgiver of Athens.

More varied, flexible, and complex than these forms of verse was the type which the Greeks called "melic" and we call "lyric," because it was sung to the accompaniment of the lyre or the flute. With a free rhythmic structure, capable of the most subtle variation, Greek lyric reached a degree of artistic perfection never surpassed. Religious and processional hymns, odes of victory, dirges, wedding songs, drinking songs, love

poems, were poured out by artists of exquisite skill, most of whom are known to us only by fragments. Greatest of them all was Pindar (518-446?), whose magnificent odes yield the scholar a pleasure which alone is enough to recompense for the labor of learning the Greek language. Sappho, who wrote about a century before Pindar, is generally esteemed as the greatest of all women poets. Her "every word," a famous critic says, "has a peculiar and unmistakable perfume, a seal of absolute perfection, and inimitable grace."

As the Greeks invented the epic and lyric forms, and brought them to a perfection which has never been surpassed, so too they invented the drama (considered as a literary form) and produced the masterpieces which are still reckoned as the drama's crowning achievements. In the crowded glorious age which followed the repulse of Persia (490-479), the awakened national consciousness of Athens found expression in a series of superb tragedies which have never been equaled except perhaps by a few of Shakespeare's. The story of how the simple choral songs and dialogues performed at the festivals of the god Dionysus flowered into the majestic tragedies of Aeschylus, Sophocles, and Euripides, and how each made improvements in the dramatic form, is told in the article on Drama.

The religious character which was impressed on Greek drama by its origin was never lost. It was acted only at the festivals held in honor of Dionysus, and wealthy citizens were chosen to bear the expense of costuming and training the chorus as a public and

religious duty. Attendance at the performances was an act of religious worship, and in the time of Pericles the state itself gave poor citizens the price of admission to the great open-air Theater of Dionysus (see Theater) that none might be debarred by poverty. All the greatest poets of the day competed for the prizes which were offered for the best plays.

The earliest of the three great Attic writers of tragedy was Aeschylus, who was born in 525 B.C. and was present at the battles of Marathon and Salamis. He wrote between 70 and 90 plays, of which 7 remain. Many of his dramas were arranged as "trilogies," that is, groups of three related plays. The 'Oresteia' (story of Orestes), consisting of the 'Agamemnon', 'Choëphori', and 'Eumenides', is the only trilogy that has survived from

"TO Greece we owe the love of Science, the love of Art, the love of Freedom. The Greek genius is the European genius in its first and brightest bloom. From a vivifying contact with the Greek spirit Europe derived that new and mighty impulse which we call Progress. If we reckon up our secular possessions, the wealth and heritage of the past, the larger share may be traced back to Greece."—S. H. Butcher.

"The Greeks, we should never forget, were the first people to show the world what real freedom and real civilization were. And they brought, not only Politics, but Art and Science and Literature of every kind to a higher pitch than any other people ever did without borrowing from others."—E. A. Freeman.

"The thoughts of the great Greek thinkers have been bearing fruit in the world ever since they were first uttered. In some special sciences, the work done by the Greeks remains a basis of study to this day. In Greek literature we have the fountain-head of all Western literature."—R. C. Jebb.

ancient times. The 'Persae' is a song of triumph for the defeat of the Persians. The 'Prometheus Bound' is a colossal rendering of the legend of the superhuman benefactor who stole fire from heaven for men (see Prometheus). For rugged power, sublimity of idea, and ethical grandeur Aeschylus stands without a peer.

For some 16 years, between 484 and 468, Aeschylus carried off prize after prize, but in 468 his place as the favorite poet of Athens was taken by a man some 30 years younger, Sophocles of Colonus (496-406 B.C.). Sophocles' long life covered practically the whole period of Athens' greatest glory. He won more than 20 victories at the Dionysia, and produced more than 100 plays, 7 of which are extant. Sophocles "saw life steadily, and saw it whole." This serenity of attitude together with the supreme skill with which his dramas were constructed, the beauty of his language and the nobility of his characters, give us a sense of majesty and harmony such as we find nowhere else in literature. He was the most Greek of all the Greek poets. His plays have been compared to the Parthenon for their power, self-restraint, and symmetry. The 'Antigone', which is perhaps the most celebrated drama in Greek literature, is typical of Sophocles' work. Its heroine is a model of womanly self-sacrifice, and underlying the whole tragedy is the sublime idea of a higher unseen law ruling the destinies of men. Others of his plays are 'Ajax', 'Oedipus Tyrannus', 'Electra', and 'Oedipus at Colonus'.

The third of the great tragic writers is Euripides (480-406 B.C.), who was born on the island of Salamis

—so the story goes—the day of the famous battle against the Persians. Although he presented his first play at 25, he did not take the prize until he was 39, and won it only five times in all in spite of his 92 produced plays. The reason for this is that he was a modern among the ancients. He questioned the popular idea of religion, and he drew real men and women instead of gods or demigods, or idealized human beings of heroic stature. For this reason Aristotle calls him “the most tragic” of the poets, for his plays, being the most human, were also the most moving. The conservatives of his own generation did not approve of him, but in later times he was exalted to a place with Aeschylus and Sophocles. His plays are more often performed on the modern stage than those of any other Greek poet. Eighteen plays have survived, including ‘Alcestis’, ‘Medea’, ‘Hippolytus’, the ‘Trojan Women’, ‘Orestes’, ‘Electra’, ‘Iphigenia at Aulis’, and the ‘Bacchae’.

From Greek comedy only the plays of one man have survived—those of Aristophanes (about 448–385 B.C.), who was for 40 years “the great burlesque critic of Athenian life.” His comedies are gay fun-making about the things of his own day, always from the standpoint of the conservative. He ridicules the new learning, in the person of Socrates, and savagely lashes Euripides, who stood for the inquiring innovating attitude that he particularly hated. Socialism, women’s rights, the Peloponnesian War, the fondness of the poorer citizens for serving on juries now that Cleon had raised their pay to ten cents a day—these and other aspects of current Athenian life served as subjects for his stinging sarcasm and boisterous humor. Eleven of his plays survive, including the ‘Knights’, ‘Clouds’, ‘Wasps’, ‘Frogs’, ‘Ecclesiazusae’ (Women in Parliament), ‘Lysistrata’, and ‘Birds’.

As always in literary history, Greek prose was late in developing. In the 6th century some of the early philosophers formulated their ideas in brief sententious prose maxims, but the first truly literary use

of prose is in the ‘History’ of Herodotus, written about the middle of the 5th century (*see* Herodotus). The theme of Herodotus is the struggle between East and West, culminating in the Persian Wars. His great successor Thucydides (about 471–396) told the story of the Peloponnesian Wars. Thucydides’ critical use of sources, his inclusion of documents, his

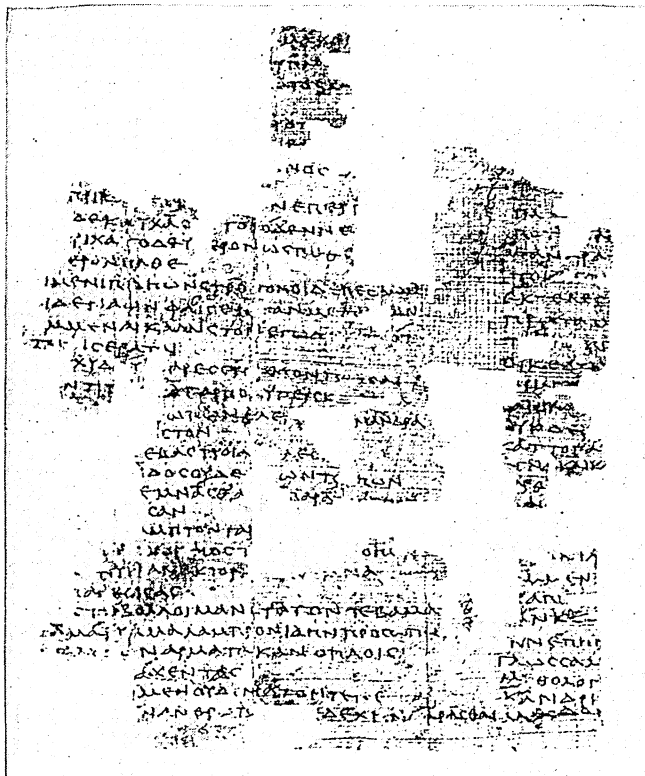
laborious research into the roots of events, make him the most modern of the Greek historians—“the first philosopher of history”—far removed from the romantic inclusiveness of Herodotus or of Xenophon (*see* Xenophon).

The 5th century also saw the rise of another prose art, the art of oratory, with its companion art of rhetoric, which taught the technique of making successful speeches. With the establishment of democracy in Athens and other Greek cities, the ability to make convincing speeches before the popular assemblies, and especially in the law courts, became of the greatest practical value. Litigants were usually compelled to plead their own cases, instead of hiring others to plead for

them; so rhetoric became part of the ordinary education of the youth, and a new profession arose—that of the writer of speeches for men to speak in their own behalf. A large proportion of the speeches of the Attic orators that have come down to us were meant to be used in this way. The 4th century was the golden age of oratory, made memorable by the polished and artful speeches of Lysias, Isocrates, Aeschines, and the master orator of all time, Demosthenes (*see* Demosthenes).

The same lively curiosity and insatiable interest in the spectacle of the universe which led the Greeks to invent epic and lyric verse, drama and history, also made them the first philosophers. Their craving to find a reasoned answer to the riddles of life resulted in the creation of another department of prose literature, represented chiefly by the great names of Plato and Aristotle. Beginning with the 6th century, one thinker after another advanced his theory of the

A FRAGMENT OF SAPPHO'S POETRY



Very little of Sappho's poetry has come down to us. The character of her work is known largely through brief quotations from her poems found in the writings of other authors. Three fragments written on Egyptian papyri have been discovered in recent years, one of which is here reproduced.

material causes of the universe, of knowledge, and of conduct. Many of the fragments of their teachings which have been preserved in the form of terse epigrammatic statements in prose or verse seem crude and childish to us today, but they serve to remind us how long and toilsome is the road that leads to wisdom. (See Pythagoras.) The first thinker to lay a really scientific basis for philosophical inquiry was Socrates (469-399 B.C.), whose tireless questioning into the roots of conduct and searching criticism of all traditional doctrines so outraged the orthodox and narrow-minded that he was put to death (see Socrates). He wrote nothing himself, but his great pupil Plato (427-347) perpetuated and developed his teaching in a matchless series of dialogues, packed with fresh and stimulating ideas which have inspired every philosophical thinker since his day (see Plato). Third of the immortal trio of Athenian thinkers was Plato's pupil, Aristotle, the father of science. Aristotle sought to map out nearly the whole field of human knowledge into the various sciences, laying a foundation for all later scientific inquiry. In the history of literature, his work cannot rank with the superbly artistic Platonic dialogues, but in the history of thought he is acknowledged as "the master of those who know." (See Aristotle.) Theophrastus, who succeeded Aristotle as head of the school called the Lyceum, is chiefly remembered for a series of lively character sketches which have found imitators in every age.

With these names the story of classical Greek literature ends, but the Hellenistic age in Alexandria offers us a second rich library (see Alexandria, Egypt). The name that stands out in poetry is that of Theocritus, who wrote exquisite little shepherd dialogues picturing the rural life of his native Sicily. Imitators from Vergil to our own day have tried in vain to recapture the freshness and charm of the pastoral form as Theocritus first used it. Other poets of this age are the lyric poet Callimachus; Bion and Moschus, writers of pastoral verse; and Apollonius Rhodius who wrote the *Argonautica*, an epic in four books on the quest of the Golden Fleece. Greek prose, too, continued to flourish far into Roman times, and from these later days we have our first forerunners of the novels (see Novel), as well as important works of geography and history.

The most noteworthy of these later writers are the historians Polybius, Diodorus Siculus, Josephus, and Appian; the geographers Strabo and Pausanias; the biographer Plutarch, who has given us more general information about antiquity than any other single writer (see Plutarch); the critic Longinus, to whom is assigned one of the best of all works of literary criticism, the treatise 'On the Sublime'; the humorist Lucian, whose 'Dialogues of the Gods' are almost as outrageously laughable as a comedy of Aristophanes; and the two Stoic philosophers Epictetus and Marcus Aurelius, one a slave and the other an emperor (see Epictetus; Marcus Aurelius Antoninus).

In various localities the Greek language was spoken and written with variations sufficiently great to cause three chief dialects to be recognized, though the differences were never so great as to cause difficulty of communication. The Ionic dialect, the language of Homer and Hesiod, was spoken in most of the Aegean islands and on the west coast of Asia Minor. With a few modifications, the Ionic is identical with the Attic, the principal literary dialect, used in the works of the great Attic writers. The Doric, the language of Pindar and Theocritus, was spoken at Corinth and throughout most of the Peloponnesus. The Aeolic, in which Sappho wrote, was spoken in Boeotia, Thessaly, and Aeolis (northern Asia Minor).

In modern Greece there is a sharp cleavage between the dialect of the people, called "Romaic," and the literary language, which represents an attempt to return so far as possible to the standards of classical Greek. The struggle between the "purists" and the adherents of the popular tongue is still waged with so great bitterness that in 1901, 20 persons were killed or injured in a mass meeting of protest against the proposed issue of a translation of the Gospel into Romaic. The style of most current literature and journalism represents a compromise between these two ideals, but the most powerful poetry and fiction are written in the "vulgar" tongue.

GREELEY, HORACE (1811-1872). If it is true that "the pen is mightier than the sword," then Horace Greeley, the newspaper man, might possibly be considered greater than Grant and Lee or any other general of the Civil War. Not only was he the greatest molder of public opinion in the period preceding and during the war, but he was probably the greatest journalist America has ever produced. Because of the importance of his work the poet Whittier called him "our later Franklin."

Greeley was, in his own words, "born in poverty, cradled in obscurity, and early called from school to rugged labor," but he sought "to convert obstacles into opportunity, and wrest achievement from difficulty," and his efforts were successful.

Born in New Hampshire, he learned the printing trade in Vermont, and later joined his parents in western Pennsylvania. In 1831 he went to New York with \$10 in his pocket and his clothes in a bundle carried over his shoulder. After several newspaper ventures which brought him much notoriety but little money, he started the *New York Tribune*, as a Whig daily, in 1841.

The success of this paper was immediate, and its circulation soon covered the country from the Atlantic to the frontier of Missouri. In its columns Greeley opposed slavery, advocated a high protective tariff, and aided the temperance movement. At the outbreak of the Civil War he urged the government to refrain from "pinning one section to another by bayonets." Afterwards he was an earnest upholder of the government, and he urged the emancipation of the slaves even before Lincoln was ready for that step.

After the war was over Greeley wished the country to treat the South leniently. To set an example, he signed the bond by which Jefferson Davis was given

his freedom. He could not carry the country with him in this attitude, however; and in 1872, when he was the candidate of the Liberal Republicans and the Democrats against Grant, he was disastrously defeated. Borne down by political and domestic misfortune, he fell ill, and died Nov. 29, 1872.

In spite of the success of the *Tribune* and the large sum Greeley made on the lecture platform, he was never wealthy, because he always aided everyone who asked him for help, both the worthy and the unworthy. He was extremely simple in his habits and careless in his dress. His handwriting was so poor that it was the despair of type-setters on the newspapers, who declared that it resembled nothing so much as the muddy tracks a hen would make walking over a piece of white paper. For brilliancy of mind and high moral courage, he was unsurpassed among the men of his day.

GREENE, NATHANAEL (1742-1786). By common consent the brilliant general Nathanael Greene is regarded as a military leader second to Washington alone in the American Revolution. His father was a blacksmith in Potowomut, R.I., but a Quaker preacher on Sundays, and trained his son in the strict principles of that sect. When the quarrel between the colonies and England was growing hot, Greene joined the militia and studied military tactics. For this martial zeal he was excommunicated by the Friends' Church. His military training won him a brigadier-generalship and the command of the Rhode Island forces in 1775. He marched his troops to Cambridge after the skirmishes at Lexington and Concord and welcomed Washington as the new commander-in-chief in July 1775.

Greene speedily won the friendship and confidence of Washington, under whom he served with distinction at Trenton, Princeton, and Brandywine. At Washington's request he accepted at Valley Forge, in March 1778, the difficult position of quartermaster-general, retaining, however, the right to command troops in the field. Because of the meddling of Congress with the affairs of his department Greene resigned his position in 1780, but was shortly afterwards appointed by Washington as commander of the Army of the South.

When Greene succeeded Gates in this command, he found the army in so wretched a state, without discipline, arms, or clothing, that he could not bring it into condition for fighting until 1781. As soon as this had been accomplished, he began a campaign which in less than a year stripped the English of all their

conquests in the Carolinas and Georgia except Charleston, in which he penned up the British army for the rest of the war. For this he received the

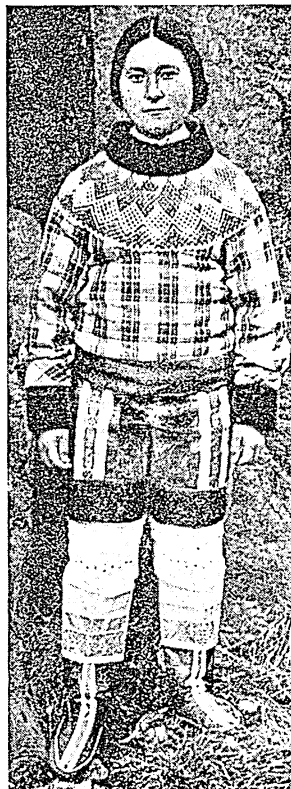
CHILDREN OF THE LAND OF SNOW

Whatever other people think of the climate of Greenland, it is easy to see that it just suits little Shoo-e-ging-wah and Megipsoo.



thanks of Congress, large grants of land from the Carolinas and Georgia, and the name of "the man who saved the South" in the American Revolution.

GREENLAND FASHIONS



Here we see a Greenland belle dressed in her finest party clothes.

GREENLAND. Perhaps four-fifths of this, the largest island in the world, is buried under an ice cap that averages 1,000 feet in depth. The area of Greenland is variously estimated at from 735,000 to 1,250,000 square miles. It is more than 1,600 miles long, with a maximum width of between 600 and 800 miles. Men can live only on the rocky coastal fringe, chiefly in the southwest. Except for one or two tiny settlements, the east coast is uninhabited.

The west coast is warm enough to support tundra vegetation with a few stunted birches and willows. The Greenlanders, who are Eskimos with a mixture of European blood, support themselves chiefly by hunting seals, whales, walrus, bear, and fox, and by fishing for cod, halibut, and salmon (*see Eskimos*). Potatoes and other root crops are grown, but even the hardiest of grains—barley—will not ripen here and is grown only as fodder for the few goats, sheep, and cattle. The houses are mostly of stone and sod, for lumber has to be imported. A few Eskimos build snow igloos for the winter or when traveling.

Lying to the northeast of North America and almost wholly within the Arctic Circle, Greenland is subject to intense cold, terrible blizzards, and almost constant fog. Flowing down from "Greenland's icy mountains," glaciers discharge a billion tons of ice into the sea every year (*see Glacier*). Many of these enormous icebergs are carried down into the lane of

ocean travel, where they are a constant menace to navigation in spring and summer (see Icebergs).

The Greenlanders have to import much of their food, clothing, and other necessities. The most valuable export is cryolite, a scarce mineral mined nowhere else. It is used in separating aluminum from its ores and in making glass and enamelware. Other exports are whale and seal oil, fish products, eiderdown, and skins. There are schools in all the settlements, several radio stations, and monthly newspapers in Eskimo. Nearly all the people can read and write.

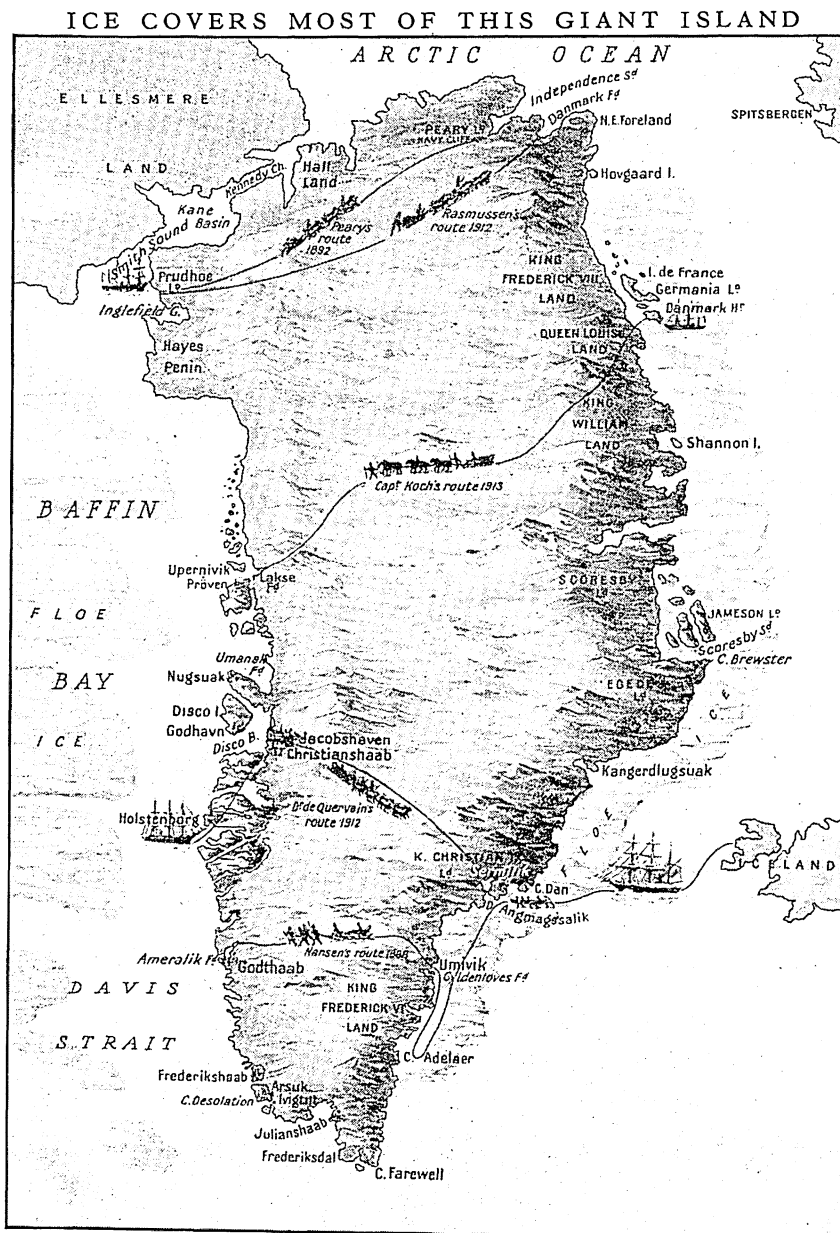
At the end of the 10th century Eric the Red, exiled from Iceland, sailed to the southwestern coast of Greenland and founded a colony. He apparently gave it the inviting name of Greenland to attract settlers from Iceland. In 1261 the colony came under Norwegian rule. Communication with Norway ceased in the 15th century and Greenland became lost to the world until the close of the 16th century, when it was rediscovered by English explorers. In 1721 Hans Egede, a missionary, began a modern colonizing movement. When Norway and Denmark dissolved their union in

1814, Greenland was not mentioned, and so Denmark kept it. In 1933 the World Court disallowed Norway's claims to the east coast. In recent decades Greenland has been a favorite field for explorers and a stepping-stone for polar exploration (see Peary, Robert Edwin). Americans have discovered, explored, and named many regions on its northern and northwestern shores.

As an outpost of American defense and a weather forecasting center for the North Atlantic, Greenland took on new importance in the second World War. To keep it from falling into the hands of the Germans, who had been using the east coast to get weather information, the United States in April 1941 signed an agreement with the Danish minister at Washington permitting it to build air bases and other defense facilities. Population, about 18,000, including a few hundred Danish traders, miners, clergymen, and teachers.

GREGORY, POPES. Sixteen popes—two of them among the greatest the church has produced—have borne this honored name.

GREGORY I, called the Great (lived about 540–604), was a Roman of old family and great wealth who became a monk in a Roman monastery which he himself endowed. His interest in the island of Britain was aroused by seeing some comely English boys sold as slaves in the market place at Rome, and



The routes of some of the explorers of Greenland are shown here. In recent years Donald MacMillan, Lauge Koch, Alfred Wegener, and others have also explored the island. The University of Michigan-Pan American Airways Expedition of 1932–33 and Charles Lindbergh in 1933 studied the feasibility of an air route between Europe and North America via Greenland. In 1941 the United States secured the right to air bases.

when he became pope in 590, he sent St. Augustine as missionary to England to convert the people from their heathenism. Gregory defended Rome against repeated attacks of the Lombards and exercised much of the power in the West which had fallen from the hands of the weak Eastern emperors. He also wrote ably on theology and composed the Gregorian chant which is still used in church services. He was one of the ablest of the popes, and after his death was made a saint.

GREGORY VI (died 1047) earned a high reputation for learning and uprightness, but he was deposed by a council held by Emperor Henry III, on the ground that in a time of confusion he had obtained his office by improper means.

GREGORY VII was the mighty Hildebrand (lived 1020-1085). After being the power behind the throne for a quarter of a century, under five popes, he himself was chosen pope in 1073. His pontificate is memorable for the beginning of the great Investiture Conflict with the Emperor Henry IV of Germany. His purpose was to create a sort of "league of nations" with the Pope as its head. A Catholic historian sums up Hildebrand's ideas in these words: "Seeing the world sunk in wickedness and threatened with impending ruin, and believing that the Pope alone could save it, he conceived the vast design of a universal theocracy, which should embrace every kingdom of Christendom, and of whose policy the Ten Commandments should be the fundamental principle. Over this commonwealth of nations the Pope was to preside. The spiritual power was to stand related to the temporal as the sun to the moon, imparting light and strength, without, however, destroying it or depriving princes of their sovereignty."

After a violent conflict Henry IV was obliged to humble himself, barefoot and fasting, before the Pope at Canossa (1077). But the struggle soon recommenced. Henry attacked the Pope in Rome itself; and the aid of the Norman Robert Guiscard only permitted Gregory to retire from Rome to Naples. He died at Salerno shortly after, saying: "I have loved justice and hated iniquity; therefore, I die in exile." No pope ever left a stronger impress on his time than did the fearless, upright, inflexible Gregory VII.

GREGORY IX (pope 1227-1241) is chiefly memorable for his conflict with the Emperor Frederick II. GREGORY XI (pope 1370-1378) was a French churchman who instituted many reforms and transferred the papacy back to Rome from Avignon, where it had been for 70 years. GREGORY XII (pope 1406-1415) upheld the rights of the Roman pontiffs against the Avignonese antipope Benedict XIII, in the time of the Great Schism. GREGORY XIII (pope 1572-1585) made the great reform in the calendar. GREGORY XVI (pope 1831-1846) encouraged learning and founded the Egyptian and Etruscan museums in the Vatican.

GRENFELL, SIR WILFRED THOMASON (1865-1940). In 1892 a young English doctor named Wilfred Grenfell arrived in Labrador. His mission in this bleak

northern land was to aid its poor fisherfolk, who lived under conditions so primitive that the entire population was in danger of extinction. Almost continuously, for more than 40 years, he remained at his task of mercy. When he died, "Grenfell of Labrador," as he was called, left healthy and growing communities where disease, privation, and ignorance had reigned.

Grenfell was born Feb. 28, 1865, at Parkgate, near Chester, the second son of a well-to-do schoolmaster.

He was educated at Marlborough, a preparatory school, and at Oxford University, where he was both a keen student and an excellent football player. Inspired by the family physician, he entered London Hospital to study medicine. At a meeting led by the American evangelist, Dwight L. Moody, the young medical student was moved to deep religious faith.



GRENFELL
The Doctor Missionary

In 1886 he obtained his degree as a physician and surgeon.

Among Grenfell's patients at London Hospital were many seamen who lacked medical aid and religious comfort during their perilous voyages in the North Sea. To help these neglected men, Dr. Grenfell fitted up an old sailing vessel as a mission ship, and for five years he roamed with the deep-sea fishing fleet. His work won such fame that he was selected to lead an expedition to Labrador to investigate the "opportunities for service" to the fishermen there.

So great were the "opportunities for service" that the 27-year-old doctor devoted the rest of his life to the task. He found the people—Indians, Eskimos, and descendants of early settlers from Great Britain—living in ignorance, poverty, and want. During the short summers, ministers and doctors from Newfoundland visited the fishing villages along the wild Labrador coast; but for eight dark freezing months of every year, the people had almost no contact with the outside world. (See also Labrador.)

Impulsively, with all his great energy and ability, Dr. Grenfell plunged into the work of relief. Across 1,000 miles of dreary coast line, he established hospitals, nursing stations, schools, agricultural and trade coöperatives, and churches. Every summer his hospital ship cruised along the coast, stopping wherever a signal flag indicated distress. In wintertime a dog sled was his ambulance. To the forsaken inhabitants, he was all things: doctor, teacher, minister, and friend. Only once did he leave them for any length of time—to serve in France, during the World War of 1914-18, as a major in the Harvard Medical Unit.

His cause, tirelessly expounded in lectures and books, won widespread support in England and the United States. Lord Strathcona, who called him "the most useful man in the North American continent,"

was a generous patron (*see* Strathcona). The International Grenfell Association, founded in 1912, raised money and recruits, doctors and students, mostly Americans, to carry on the work.

Dr. Grenfell's life was crowded with honors and happiness. He had an able assistant and devoted companion in his American wife, Anne MacLanahan, whose beauty and wit so impressed young Grenfell that he proposed to her during an ocean voyage before he knew her name. He was knighted in 1927 by King George V.

The best book on Dr. Grenfell's life and work is his autobiography, 'Forty Years for Labrador' (1932). Among his other books are 'Adrift on an Ice Pan' (1909), 'The Adventure of Life' (1912), 'Labrador Days' (1919), 'Deeds of Daring' (1934), and 'The Romance of Labrador' (1934).

GREY, LADY JANE (1537-1554). This sweet-souled and innocent child, the "nine-days' queen" of English history, was sacrificed to the self-seeking ambition of shameless intriguers. By the will of her great-uncle, Henry VIII, she had been placed next after his daughters Mary and Elizabeth in the line of succession to the throne. It was thought possible to discredit Mary and Elizabeth as illegitimate, and thus make Lady Jane heir to the throne after the sickly Edward VI. With this purpose in mind the unscrupulous Duke of Northumberland caused her to be married to his son Guildford Dudley; by this means he hoped to continue himself in power after Edward's death. Edward died on July 6, 1553. Lady Jane was proclaimed queen on the 10th. By the 19th the whole scheme had collapsed, Northumberland was arrested, and she too was a prisoner.

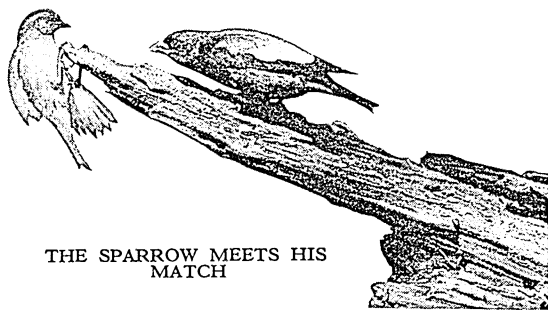
Lady Jane was never to be free again. She remained locked in the gloomy Tower of London for many months. Then an uprising against Queen Mary, in which Lady Jane's father took part, led the queen to seal Lady Jane's death warrant. She was beheaded on Tower Hill, London, on Feb. 12, 1554. In her speech from the scaffold she "washed her hands" of any desire to be queen, and said: "I die a true Christian woman." The place of her imprisonment still draws to it the feet of later generations, whose hearts have never ceased to sorrow over the hard fate of this beautiful and innocent girl.

GRIEG (*grēg*), EDVARD HAGERUP (1843-1907). The peculiar leaping rhythms and strange harmonies of Scandinavian folk-music were the inspiration that brought Grieg to a position among the great composers of the 19th century. He was born in Bergen, Norway, but was sent to Leipzig, Germany, for his musical education, and his early compositions give evidence of this German influence. But on his return to Norway his imagination was seized by the entrancing Norwegian folk-songs and he determined to develop the full beauty of these artless tunes by making them the basis of compositions for piano and orchestra. Thus he did for Norway what Chopin did for Poland, and Liszt for Hungary.

When Grieg was 31 years of age the Norwegian government granted him a life pension. Thus relieved from the necessity of teaching, he devoted himself

entirely to composition, with occasional concert tours. As a conductor he was magnetic, and everywhere he was acclaimed as a most individual and enchanting pianist. He played only his own compositions—beautiful lyrics, tone-poems for the piano, that breathe all the exhilaration and freshness of the north-land. Of his orchestral works the frequently heard 'Peer Gynt' suites are most popular. His 125 songs are hauntingly distinctive with great depth of feeling and originality in melodic and harmonic structure. The last years of Grieg's life were spent in his beautiful villa Troldhaugen, near Bergen, Norway.

GROSBEAK. "Fine feathers do not make fine birds," but often extremely fine birds have fine feathers. The rose-breasted grosbeak has beautiful black-and-white plumage with a rose-colored breast,



THE SPARROW MEETS HIS MATCH

The Sparrow has earned a bad reputation by driving away so many of our song birds, but he soon learns to let the Grosbeak severely alone. Here a Grosbeak is driving a Sparrow away from a feeding log.

a lovely song, a happy manner, and a clear conscience, for he knows that the few green peas and berries in his crop have been paid for many times over (for illustration in colors *see* Birds). Even though he lacked beauty, song, and manners, his appetite alone would make him invaluable to the gardener, for with his plainly feathered mate and his hungry brood he will rid a bug-infested potato patch of the pests in short order and supplement the potato-bug diet with such caterpillars as army-, canker-, and cutworms. Does he not deserve a few berries and peas?

Quite as much can be said in favor of other grosbeaks, which is a common name for a group of the finch family with thick powerful beaks (hence the name grosbeak). All have bright-colored feathers, lovely songs, and appetites for harmful insects. The rose-breasted grosbeak is commonly spoken of as *the* grosbeak, but other species such as the pine and evening grosbeak equally deserve the name. They are from 8¼ to 9 inches long. The females of all species are quietly colored. The feeding and nesting habits are similar, except in the case of the pine grosbeak which eats no insects and feeds almost entirely on seeds of such trees as the pine, ash, and sumac. The nest of twigs and weed-stalks is built in trees. The spotted eggs are from three to five in number. The birds migrate south in winter, though the evening and the pine grosbeaks are found wintering as far north as Iowa, Illinois, and New England.

GROUNDHOG

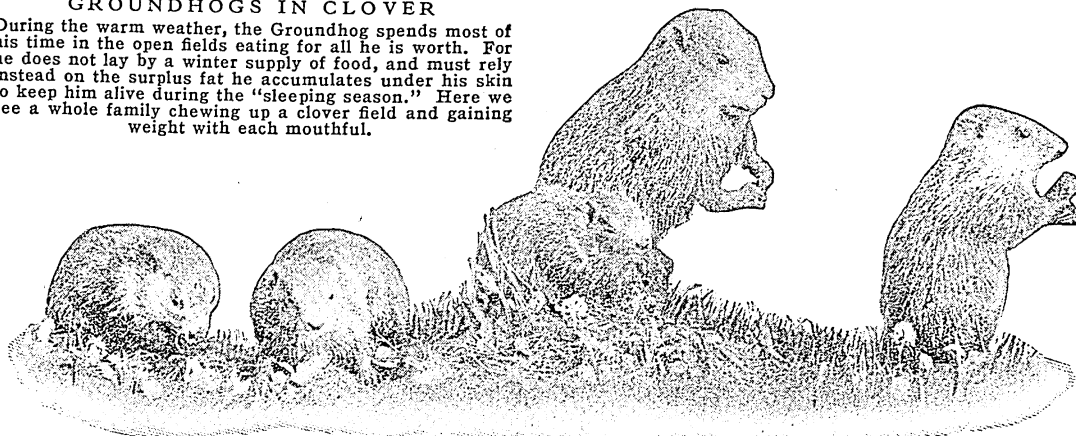
GROUSE

The cardinal is the most showy of the group (see Cardinal Bird). The home of the rose-breasted grosbeak is in the eastern half of the United States and southern parts of Canada. It winters south to Cuba

clover and succulent grasses including various cultivated crops, especially the vegetables in fields and gardens, and hence are regarded as a nuisance. They have practically no economic value. Their flesh is

GROUNDHOGS IN CLOVER

During the warm weather, the Groundhog spends most of his time in the open fields eating for all he is worth. For he does not lay by a winter supply of food, and must rely instead on the surplus fat he accumulates under his skin to keep him alive during the "sleeping season." Here we see a whole family chewing up a clover field and gaining weight with each mouthful.



and Central America. The evening grosbeak with its striking yellow and black feathers is found in Canada and occasionally during the winter flocks have been seen in the northeastern United States. The black-headed grosbeak of the Far West and Mexico has a neck and breast of tawny gold, and black wings marked with white (for illustration in colors see Birds). It is said that the female of this species, contrary to all mother-bird rules of caution, sings while on her nest. The blue grosbeak, a rather rare bird of the southern United States, has dark blue-gray feathers. The pine grosbeak is found in the pine-tree regions of both the Old and the New World. Its beautiful reddish-pink feathers which blend so beautifully into the gray under-plumage change, after molting, to yellow. Another common grosbeak of Europe is the hawfinch. It has a crown and back of rusty brown, gray under parts and black and white wings.

Grosbeaks belong to the family *Fringillidae*. Scientific name of rose-breasted grosbeak, *Hedymeles ludovicianus*.

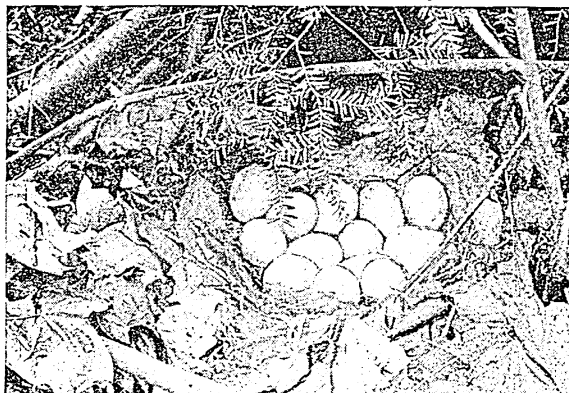
GROUNDHOG. The groundhog, also called the woodchuck, is America's most famous, though not most accurate, weather prophet. Tradition insists that on February 2 of each year—"Groundhog Day"—this little animal, which has been snugly curled up in its burrow all winter, sleepily living on its own fat, emerges for a look about to see if it is time to resume its waking life. If the sun is shining so that it can see its shadow, it retires for another six weeks of slumber in its subterranean home, according to the popular legend, but if the sky is cloudy, it remains outside, anticipating an early spring.

Groundhogs are well known in the eastern states and in Canada. They like grassy hillsides and wood-pastures, especially if there is wooded country near that offers a safe retreat. Their homes are usually in the midst of a forest where their burrows are quite elaborate affairs of branching galleries. They feed on

little esteemed and their pelts of coarse hair are worthless as fur. They do not store up food in the summer, but as the winter draws near they feed heavily and become excessively fat and when winter has come retire to their burrows and sleep until spring. Their surplus flesh is used up during this period, so that they emerge looking very thin indeed.

The groundhog or woodchuck (*Arctomys monax*) is a typical marmot, with coarse hair, heavy body, short bushy tail, and powerful legs and feet armed with strong claws. When fully grown it weighs about ten pounds. The color varies from brownish gray to almost black. When alarmed it utters a curious shrill whistle of fear.

GROUSE. The grouse is the sportsman's favorite bird, and the eagerness with which it has been hunted has almost exterminated it in some regions where it



Here's a Grouse's nest, snugly tucked away among the leaves and brush in the woods, and there are one, two, three — fourteen eggs! What large families those Grouse people have!

was once very abundant. Most of the 25 species found in the Northern Hemisphere are excellent eating and no less excellent sport for the hunter. It is the

habit of these dull-plumaged birds to lie hidden in the grass until the dogs are upon them; then, with a sudden great whirring sound, and with almost the speed of an arrow, they rise before the eyes of the startled hunter, who must be both cool and quick if he is to bag his game.

The common colors in the plumage are brown, gray, and red, with touches of purple and dark green in some species. Generally the colors of the male birds are more pronounced. The dress of the female is an excellent example of what naturalists call "protective coloration" (see Protective Coloration). It is so nearly the color of her surroundings that, if she remains motionless on her nest among the grass and leaves, even a keen-eyed fox or hawk will pass her by. Some members of the grouse family that live in regions where snow is common change their sober summer coats for a winter plumage as white as the snowy wastes they inhabit, and grow downy feathers on their feet that keep them from sinking into the snow. Other species grow horny appendages from the sides of the toes to serve as their snow-shoes.

The male birds are noisy wooers. During the mating season their peculiar love-calls may be heard ringing through the woods and over the prairie lands. These calls, which take the place of the mating song of singing birds, are dull booming sounds variously produced. Some species have a most extraordi-

nary wing power and by rapidly beating the air or their breast feathers produce a sound that may be heard a mile or more. Other species are furnished

with an air sac of loose skin which acts as a sort of bagpipe, for the bird inflates it to an amazing size; then, with a jerking of the head, he forces the air from it with a hollow "boom, boom, boom," which draws the female birds of their kind. These love "songs" are accompanied by much strutting about and spreading of feathers, and by many fights among the cocks.

Grouse range in size from the small white-tailed ptarmigan 13 inches long to the sage hen 30 inches long. They eat seeds, fruits, and insects. Among all the various species, except the ptarmigans, one cock mates with a whole covey of hens. The nest is on the ground and the hen takes entire care of the 10 to 14 eggs and of the young brood.

Of the North American species the best-known is the ruffed grouse, incorrectly known in the North as

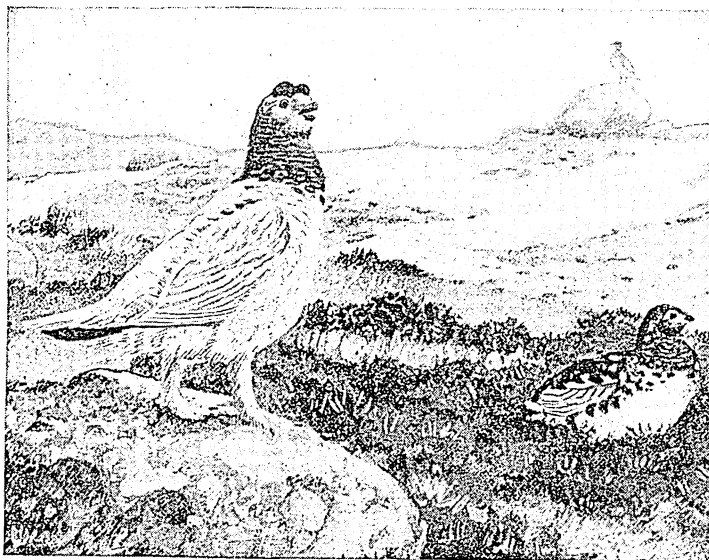
the "partridge" and in the South as the "pheasant." It is found across southern Canada and northern United States to the Pacific coast, and south to Georgia and Kansas. It is about 18 inches long and has tufts of shiny black feathers on each side of its neck, which look like a ruff and so give the bird its name. A crest of feathers adorns the top of its head. In the early days before this bird had come to know the ways

HOW THE GROUSE ATTRACTS ITS MATE



The male Grouse, instead of singing to call his mate, perches upon a log and flutters his wings rapidly, producing a booming or drumming sound which can at times be heard a mile away.

"SNOW GROUSE" IN THEIR WINTER CLOTHES



This is a scene in the far North, and the Ptarmigans or "Snow Grouse" have changed their summer coats of grayish brown to their winter clothes of white.

of man it was so trustful that it would sometimes sit quietly gazing at the traveler until it was knocked from its perch with a club. Hence it was often called a "fool hen." But once having learned the lesson of the dog and the gun, it became wise to an uncanny degree. A mother bird will try to entice hunters away from her brood by crying and fluttering along the ground as if wounded. The ruffed grouse is the state bird of Pennsylvania.

Franklin's grouse, which lives in the deep fir forests of the western mountains, is still the "fool hen." It regards its enemy, man, with friendly curiosity and will move slowly out of his way only to avoid being stepped on.

On the open prairies of the Middle West, from Canada to Texas, are found prairie chickens, or pinnated grouse. Once they were very numerous; but these fast, straight-flying birds are tempting sport for hunters and delicious food. They were shot down by the millions, and at the same time the advancing farms and settlements destroyed their natural foods and coverts. Today their numbers and range are greatly reduced. With wise protection, however, they should escape the fate of their eastern relatives, the heath hens, which are now extinct.

The sage hen is the largest of the family. Its home is the barren alkali desert, where it lives almost entirely on sage leaves. The old birds taste too strongly of sage, but the young are good food. They, too, face extermination.

The ptarmigan, or "snow grouse," lives in the Arctic regions of America from Alaska to Labrador, but sometimes migrates in the winter to the northern states. In the autumn it changes its summer coat of grayish brown to a winter coat of pure white.

The red grouse, or moorfowl, is the famous grouse of the British Isles. It is so well protected by law that it is very plentiful, and sportsmen from all over the world go to Scotland every fall for grouse shooting.

The grouse belong to the order *Galliformes*, which also includes the guans, quails, pheasants, and turkeys. Scientific name of ruffed grouse, *Bonasa umbellus*; of Franklin's grouse, *Canachites franklini*; of prairie chicken, *Tympanuchus cupido*; of sage hen, *Centrocercus urophasianus*.

GUADELOUPE (*gwä-dë-lqp'*). About 75 miles north of Martinique, in the French West Indies, lie the twin islands of Guadeloupe. These with five near-by islets constitute the largest colony of the French in this region (688 square miles). One of them is crowned by lofty mountains; the other is a low plain. The products are chiefly sugar, coffee, vanilla, cocoa, and rum. Terrible damage is often done by earthquakes and by the hurricanes. The capital is Basse-Terre (15,000 inhabitants), but Pointe-à-Pitre (45,000) is the chief town and harbor.

Guadeloupe was discovered by Columbus in 1493. Except for short intervals when it was held by England and Sweden, it has been French since 1634. It is administered by a governor and a general council. Population, more than 300,000, chiefly Negroes and mulattoes.

GUAM (*gwäm*). Turn to the map of the Pacific Ocean. Run your eye west, from Hawaii to Manila. More than two-thirds of the way across you will see that the direct line between these two points is broken by the island of Guam. That is why Guam is so important as a base for naval and air operations in wartime and as a base for transpacific aviation in peacetime.

Guam is the southernmost and the largest of the Marianas Islands. It was one of the first of the Pacific islands to be discovered by Europeans. Magellan landed on one of the Marianas, probably Guam, on March 6, 1521. He called them the *Ladrones* ("thieves") because the natives stole one of his boats.

The island has an area of 206 square miles (less than that of Chicago) and is 30 miles long and 4 to 8 wide. It is composed of coral limestone with a thin but rich covering of soil. Coral reefs ring the coasts. The northern half is mostly a plateau, 200 to 500 feet above the sea. The rugged southern half has the highest point, Mount Lamlam (1,334 feet). The interior is jungle, where goats, pigs, cats, and dogs roam wild. European cattle and water buffaloes (*carabao*) are the chief domestic animals.

The temperature from day to day varies little from the annual average of 81°F. The rainfall exceeds 80 inches a year. Arrowroot, cassava, corn, rice, sugar cane, sweet potatoes, yams, coffee, fruits, and tobacco are grown. Coconuts are the chief tree crop; the only important export is copra. The port of foreign trade is Piti, on Apra Harbor, five miles west of Agaña, the capital. The harbor is large but it needs dredging to clear it of rock and coral and a breakwater to protect it from high seas during typhoons.

Nine-tenths of the 22,290 people are natives called Chamorros. These brown people of Malay stock have intermarried so extensively with other races that there are probably no pure-blood Chamorros left.

Spaniards took possession in 1528. Missionaries arrived in 1668, financed by Maria Anna of Austria, for whom the Marianas are named. The United States cruiser *Charleston* captured Guam in June 1898, and Spain ceded it to the United States on Dec. 10, 1898 (see Spanish-American War). Spain sold the rest of the Marianas to Germany in 1899.

From 1899, Guam was a United States naval station governed by a naval commander. A transpacific cable relay station was built at Sumay in 1903. The natives, reduced from 55,000 to 9,000 under Spanish rule, increased as measures of hygiene and sanitation were enforced. Agricultural and trade schools were built. In 1936 the island was made a base for clippers flying between San Francisco and the Orient.

After the first World War, the Marianas, except Guam, were mandated to Japan. This left Guam as the only break in Japan's island barrier stretching 3,000 miles to the Equator. By the naval treaty of Washington (1922), the United States was precluded from fortifying it. When Japan refused to renew the treaty in 1936, naval experts urged that defenses and harbor works be rushed. Congress, fearing to offend Japan, refused to adopt this policy until February 1941. Little had been accomplished when Japan began war in December of that year, and the island fell within the first week.

HOME of the OLDEST AMERICAN CIVILIZATION

GUATEMALA. The most populous country of Central America is also the most Indian. In fact, it is the most Indian of all the American nations. About two-thirds of Guatemala's three million people are pure-blooded Indians of the ancient Mayan stock. They are a country within a country. Living very much as their ancestors did before the Spanish conquest, they have successfully resisted for 400 years the white man's civilization. They labor on his coffee *fincas*, they build his ever-widening network of highways, but they do not speak his language or adopt his customs. Their beautiful tribal costumes are the symbol of their aloofness.

Most of the remaining third of the population are *ladinos*, of mixed Indian and white blood. A small percentage is Spanish, German, and Negro.

Guatemala is the most northerly of the Central American republics. It stretches from the Atlantic to the Pacific, between Mexico on the north and northwest, and El Salvador and Honduras on the east. It is the second largest and potentially the richest of the Central American republics. It ranks first in foreign trade. Like its neighbors, it is a land of hot steaming coastal plains, volcano-tipped mountains, and high plateaus. (See Central America.)

Land of Eternal Spring

Most of the people live in the highlands (*los altos*) at heights of 3,000 to 8,000 feet. This is a land of eternal spring, with a mild sunny climate. The days are warm and nights cool. In the rainy season, May to November, there may be 40 or 50 inches of rain.



The church and the village market are the centers about which Indian life revolves. Here the people of the countryside sell their foodstuffs and homemade goods and buy the products of other localities. The picture shows the market of Sololá, which is typical of all. The folded cloths on the women's heads are their carrying cloths. Men's clothing is almost as colorful as the women's. The church in the background was built by the Franciscans in 1541.

The scenery is exquisitely beautiful. The snowy cones of volcanoes—some still active—look down on a countryside blazing with the bright colors of flowers and Indian costumes. Trails and roads twist skyward along breath-taking *barrancas*, or gorges, plunging hundreds of feet below. Here is one of the world's most beautiful lakes, Atitlán.

Here too is one of the world's most romantic cities, visited by every tourist. Antigua, once the richest and proudest city between Mexico and Peru, was the capital of the Spanish colony until it was destroyed by earthquake in 1773. Though the capital was removed to Guatemala City, many of the people remained in the ruined and partially rebuilt city. The Indians spread their wares on market days within the shattered walls and patios of the Jesuit church, monastery, and college. A native pottery works occupies the cloisters of Las Capuchinas, the first Catholic sisterhood in Central America. Coffee *fincas* (plantations) have grown up about others of the city's 80 churches and monasteries. Some lovely Moorish residences, the Palace of the Captains General, other public buildings, and the nave of the Cathedral have been restored.

Twenty-five miles from Antigua is the new capital, Guatemala City, a great modern city about as large as Nashville, Tenn. It has been repeatedly leveled by earthquakes and repeatedly rebuilt, so that few old buildings remain.

There are no other large cities. About 125 miles west of Guatemala City, high in the mountains (7,600

FACTS ABOUT GUATEMALA

Extent.—North to south, about 280 miles; east to west, about 260 miles. Area, 45,452 square miles. Population, 3,284,269 (1940 census); at least 60 per cent pure Indian.

Physical Features.—Cordillera along Pacific coast; about 30 volcanoes (Tacaná, Acatenango, Tajumulco more than 13,000 feet). High valleys and plateaus, with parallel ranges striking eastward from highlands. Pacific and Caribbean coastal plains; plain of the Petén at base of Yucatan peninsula.

Exports.—Coffee and bananas (90 to 95 per cent of total value); chiclé; gold; vegetable oils; hides.

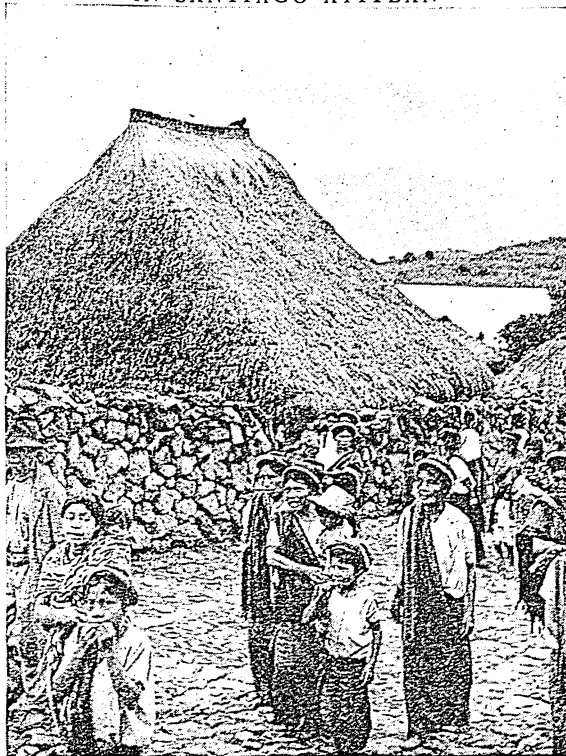
Other Products.—Corn, beans, wheat, sugar cane, rice, cotton, live stock; mahogany, logwood, cedar, kapok; textiles, pottery, shoes, soap, flour, sugar.

Imports.—Cotton fabrics, foodstuffs, iron and steel manufactures, tools and machinery, railway and road materials.

Chief Cities.—Guatemala City (capital, about 175,000); Quezaltenango, Cobán (over 25,000); Zacapa, Antigua, Puerto Barrios, San José.

feet), is Quezaltenango, with about 30,000 people. This city was named for the national bird, the quetzal (see Quetzal). Far inland, near the center of the country, is the slightly smaller Cobán (4,200 feet), chief center of the coffee trade.

IN SANTIAGO ATITLÁN



Very different from these modern cities are the Indian villages. Most of the Indians live not in the village but in the hills and valleys about it. So large a community as Sololá, one of the chief trading centers, may appear to have only a few hundred residents. Chichicastenango, the village most visited by tourists, is little more than a large plaza and a few narrow streets. Yet it is the center of a municipality of 40,000 people.

The Indians and How They Live

Every Indian village is a little world to itself. Its people weave their own beautiful costumes, which differ in every village. They speak their own dialect. They rarely marry out of the village. In many villages the land is held in common. In others, each family owns enough land to raise its own corn and vegetables.

In the great plaza before the church is held the weekly or semiweekly market. Each village specializes in some product which its traders sell in the markets of its neighbors. On market day hundreds of traders

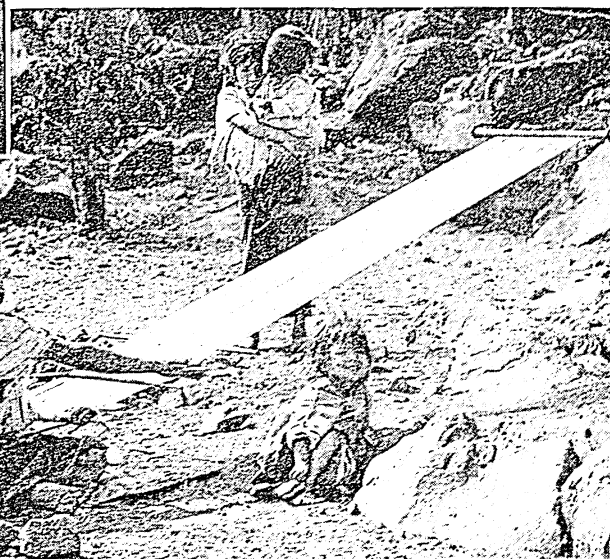
pour in. All are on foot, for they are too poor to own pack animals. The wife trots along after her husband, a baby slung in a cloth across her back, a basket balanced on her head. In the basket may be calla lilies, a live turkey, a pot of honey, a pound of black beans—whatever she may have to trade.

In a large market one lane may be devoted to leather goods, another to machine-made cotton goods. Here are hand-woven blankets; there are wild caged songbirds, and water jars. Open charcoal fires burn along the food lanes where the women are making *tortillas* (flat cakes of corn bread), and weighing grain, vegetables, and fruits on simple scales.

When coffee-picking season comes, the villages and their farms are deserted. The government compels the Indians to work for wages at least a hundred days a year. This provides labor to pick the vitally important coffee crop. At the same time it protects the Indian from the evils of peonage. He may no longer be held in semislavery to work out his debts to the *finca* owner. (For more details about Indian life, see Central America.)

The Agriculture of the Highlands

Coffee is grown almost everywhere in the highlands. By far the most important money crop, it represents 60 to 65 per cent of the total value of exports. Germans own a large share of the coffee lands, and until the second World War they controlled the export trade.



The thatch-roofed, mud-walled house just back of the stone wall in the picture above is a typical highland Indian home. Below, the woman is weaving on a hand loom. The hood over the baby's head protects him from the Evil Eye.

Corn is the staple of the native diet. Every village has its corn field, and many rituals are associated with planting and harvesting. It is perhaps no coincidence that the predominating colors of the native costumes, red, yellow, white, and black, are the colors of corn. Mayan legend declares that the first four men created were made of corn paste, and the Mayans first cultivated corn from the wild grass *teocentli*.

Various other crops are grown on the rich volcanic soil. Above the coffee zone are wheat, barley, and potatoes. Below the coffee zone are black beans and other vegetables, cacao, sugar, rice, fruits, and cotton. Except bananas and sugar, these are all grown by

A WOMAN OF ANTIGUA



This woman is selling strings of sweetmeats in the plaza of Antigua. Like most Indians she is barefooted.

primitive methods for home consumption. On the lower slopes on the Pacific side are scattered cattle ranches.

The narrow Pacific coast, protected from the trade winds by the mountainous backbone, has a wet and a dry season. It is covered with grasslands, marshes, scrubby bushes, and deciduous forests.

Besides the highlands and the coastal lowlands, there is a third great division, which makes up about a third of the area. This is the great empty Petén plain, which thrusts far northward like a wedge between Mexico and British Honduras. It is partly grassy lowland, partly jungle. In all its 14,000 square miles there is not a road or a navigable river. From the Petén and the neighboring regions in Mexico and British Honduras comes virtually all the world's supply of chicle. from

which chewing gum is made (see Chewing Gum). The chicle is flown out by airplane.

Other Resources and Industries

Forests cover more than 2,000 square miles. In addition to chicle they contain valuable cabinet woods, dyewoods, and medicinal plants. These resources are little developed away from the coasts because of the lack of transportation. The *ceiba* tree is the source of *kapok* or "tree cotton."

One United States company has planted several hundred thousand of these trees. Cinchona or quinine trees have been planted with the assistance of the United States Department of Agriculture.

Although Guatemala has a great variety of minerals, the difficulty of transportation has discouraged their exploitation. Gold is found in some of the

short, swift rivers, and is exported in small quantities. Some chromite is exported; lead, salt, and sulphur are produced for home use.

There is little manufacturing. The Indians make nearly everything they use except knives (machetes), and the rest of the population has little buying power. The few textile mills import most of their raw materials. Other products are flour, sugar, soap, pottery, shoes and other leather goods, bricks and tile, and furniture. The United States usually supplies about

Traders trudge from market to market carrying burdens of 80 or 100 pounds. This merchant is carrying a huge load of water jugs tied to a wooden carrying frame which is supported around the man's forehead with a tumpline.

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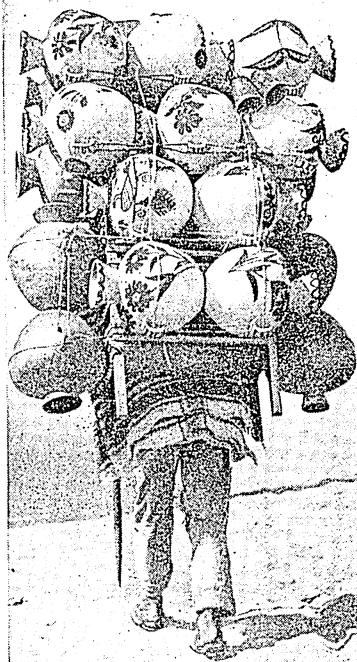
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TRAVELING MERCHANT



Traders trudge from market to market carrying burdens of 80 or 100 pounds. This merchant is carrying a huge load of water jugs tied to a wooden carrying frame which is supported around the man's forehead with a tumpline.

DANCE OF THE CONQUISTADORS



This popular annual dance celebrates the Spanish conquest. The masks represent Alvarado, whose red-gold hair won him the name Tonatiuh, "Child of the Sun."

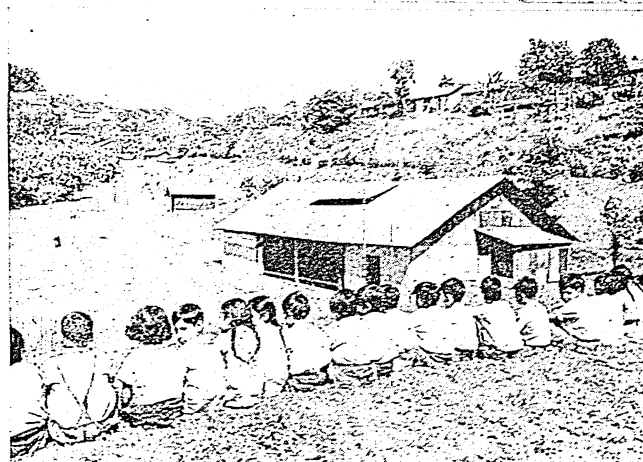
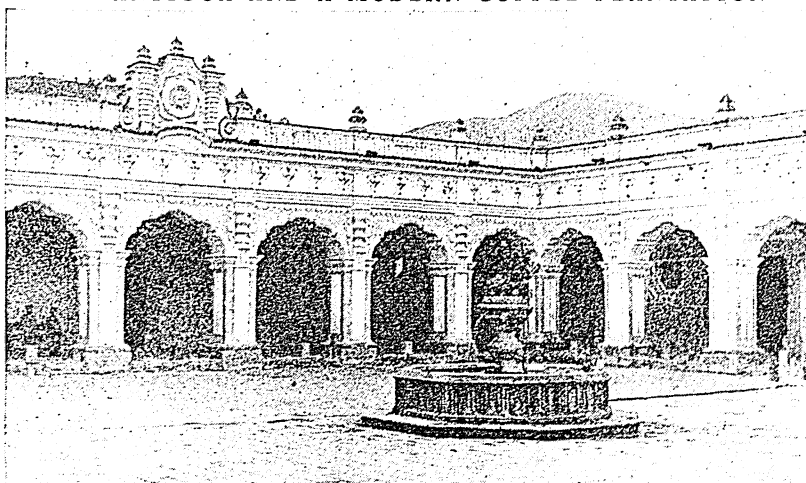
half of the imports and takes two-thirds of the exports.

Many roads have been built in recent years, and most of the cities of importance can be reached by automobile. Guatemala was the first country to complete its share of the Pan American Highway. Air service is well developed. Guatemala City is connected with both oceans by rail.

Education and the Arts

All children between 7 and 14 are supposed to attend school, but the government has so far been unable to provide enough schools and teachers. Only

OLD ANTIGUA AND A MODERN COFFEE PLANTATION



The beautiful Moorish building above, now a museum in Antigua, was the University of San Carlos Borromeo, which held its first classes in 1681. The University moved to Guatemala City after the earthquake of 1773. The children below live on a coffee finca. As they do not wear the Indian dress, they are probably *ladinos*, or mixed white and Indian.

about one in five of the people can read and write. In recent years there have been special efforts to set up rural schools and improve instruction. But even in the cities many children of school age get no schooling. Secondary schools exist only in the largest cities. Guatemala City has a number of vocational schools and the National University, which includes several professional schools. The National School of Law is in Quezaltenango. In the Indian village of San Pedro Sacatepéquez is the Industrial School of Spinning and Weaving, maintained by the government to keep alive the beautiful native textile arts.

In literature Guatemala has produced several writers of distinction (see Latin American Literature). Its greatest painter is Carlos Merida. Other artists are the painters Humberto Garsvito and Alfredo Galvez Suarez, the sculptor Yela Gunther, and the puppeteer Tony Sarg.

History and Government

Guatemala was the cradle of the Mayan civilization. This civilization reached its height in the Petén plain and the

neighboring Yucatan peninsula, where archeologists are uncovering many of its ancient cities (see American Archeology; Yucatan). The highland tribes were conquered and virtually enslaved by Pedro de Alvarado between 1522 and 1524. Under Spanish rule Antigua was the seat of government for all Central America. When Guatemala won its freedom in 1821, it was for a time the leading state in the Federal Republic of Central America. Since 1838, when the republic broke up into independent states, Guatemala has been governed by a few long-term dictators: Rafael Carrera (1839-1865); Justo Rufino Barrios (1871-1885); Manuel Estrada Cabrera (1898-1920); and Jorge Ubico (1931-). General Ubico protected the Indians and put through the most progressive reform program in the country's history. The republic declared war against the Axis in December 1941 and gave the United States air and naval bases. The constitution provides for a president and a National Assembly of one chamber, elected by universal suffrage. The Council of State has three members elected by the National Assembly and four appointed by the president. Roman Catholicism is the prevailing religion, but all creeds are tolerated. (See also Latin America.)

GUAYULE (*gwä-yo'lā* or *wi-yo'lā*). When war cut off the supply of rubber from Malaya and the East Indies early in 1942, the United States turned for part of its new supply to a dusty-looking Mexican shrub, the guayule. Its roots and stems give the same latex which is obtained from rubber trees for manufacture into rubber. Being a desert plant, it could grow naturally from the Rio Grande to the Pacific coast. If enough bushes could be planted, and certain special problems could be solved, here was a good source of rubber.

Experiments had been made with guayule in Mexico, Texas, and California since 1907; but the rubber had cost from 15 to 20 cents a pound, and plantation rubber could be produced in the Orient for much less. This hampered development until the United States started intensive work under a bill signed March 5, 1942, with an initial project to maintain 75,000 acres of plants in the western hemisphere.

For this start, some 24,000 pounds of seed were available, or enough for 45,000 acres, if planted in rows

and cultivated. Every year, each acre should yield seed enough for ten acres, and store up at least 320 pounds of rubber. Thick sowing, from airplanes, might yield half a ton an acre, with seed, in one year. By a combination of these methods, a sufficient supply might be obtained in from four to five years. Experts believed that the total acreage need not amount to half as much as is planted to cotton in Texas.

Harvesting is done by machines which uproot the plants. Then they are ground between rollers. The resulting meal is powdered, and the latex is floated off in settling tanks. It must be treated to remove resin, which amounts to about one-fifth of its weight, or five times as much as in latex from rubber trees. The latex is then dried under vacuum into rubber, and pressed into slabs for use.

Guayule grows to about one yard high and a yard wide when fully mature. It may live for 50 years, storing rubber during dry seasons for ten years. The flowers are small white or yellow stars; the bladelike leaves are two inches long. The plant belongs to the aster family; scientific name, *Parthenium argentatum*.

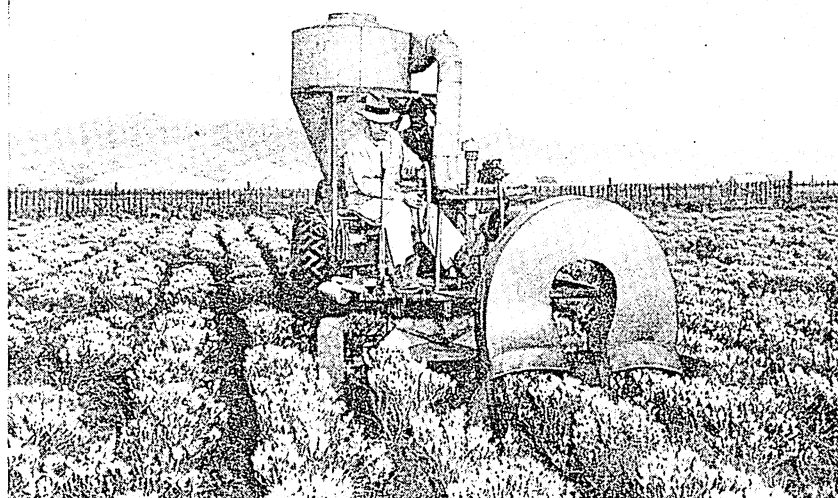
GUELFS (*gwělfz*) AND **GHIBELLINES** (*gib'ě-līns*). The rivalries of these two great political parties long distracted Germany and Italy. "Welf" (which is "Guelf" in Italian) was the name of a ducal family which ruled Bavaria and Saxony in the Middle Ages. Its most noted member was Henry the Lion (1129-1195), who was deprived of his lands by the Hohenstaufen emperor Frederick I (Barbarossa). The rival battle cries of these two families—"Hi, Welf!" and "Hi, Waiblingen!" (the latter from a little village in Swabia near Castle Hohenstaufen)—became in Italy "Guelf" and "Ghibelline," respectively.

The Hohenstaufens stood for a strong monarchical government and for the imperial rule over Italy. The Guelfs stood for feudal opposition to the monarchy and for the independence of the Italian towns. The influence of the papacy was usually on the side of the Guelfs. After the fall of the Hohenstaufen emperors (1254), the larger issues between the two parties were lost sight of in petty feuds. By the 15th century the names Guelf and Ghibelline lingered only in Italy, where they came to mean little more than local factions marked by trivial practises such as wearing feathers in the cap, or making certain gestures in speaking.

The house of Welf (Guelf) continued to rule certain parts of Germany—Hanover and Brunswick—until late in the 19th century. With George I, in 1714, the Guelf (or Guelph) family came to the throne of Great Britain as the Hanoverian line.

GUIANA (*gē-ā'na*). That little known part of South America which lies between the Orinoco River, the Amazon River and its tributary the Rio Negro, and the Atlantic Ocean, is known to geographers as Guiana. In common usage, however, Guiana means especially the three colonies of British Guiana, Dutch Guiana, and French Guiana. The coast is everywhere low, hardly rising above high watermark. For 20

A SUCTION MACHINE GATHERS GUAYULE SEED



As the machine passes along the rows, the U-shaped unit sucks up seeds, leaving the plant to grow. This economical procedure cannot be used if the guayule is sowed broadcast.

miles inland the land was once a mangrove swamp, but it was diked and drained by the early settlers and thus made into fertile plantations.

Along the shores and on the banks of the numerous rivers, where similar plantations have been formed, live the scanty population. Beyond the stretches of rich heavy loam brought down by the rivers, lie low ridges of sand and shells, showing where the coast line was in former ages. Farther inland the country rises into a rocky hilly plateau (3,000 to 4,000 feet above sea level), covered with primeval and almost impenetrable forests, except where grassy plains or savannas occur. The ranges of low mountains and hills which traverse this plateau are rich in gold, aluminum ore, and other minerals.

In the perpetual summer of the hot moist climate vegetation flourishes. The district is noted for the height and variety of its trees, many of which furnish valuable woods, and for the size of the leaves and flowers. Orchids sometimes grow in large masses with flower stems 12 feet high, and gigantic vines festoon the trees. In the lagoons and rivers grow many kinds of water lilies. The largest, the famous *Victoria regia* with leaves six or seven feet across, has been carried from British Guiana to many other parts of the world. Alligators and great fish of innumerable species abound in the rivers, and the forests are filled with richly plumaged birds, such as the scarlet ibis, white egret, and flamingo; with reptiles of many kinds; and with wild animals, such as the tapir, the sloth, and the ant-eater,

jaguar, and monkey. The insects are remarkable for the great number of varieties represented and for the brilliance of their coloring.

The Guiana coast was first sighted on the third voyage of Columbus in 1498. During the 16th century Spaniards and Portuguese ventured up its rivers in search of the fabled El Dorado. Sir Walter Raleigh led an expedition to the Orinoco River in 1595 and again in 1617 (see Raleigh, Sir Walter). By the middle of the 17th century British, Dutch, and French traders had founded several settlements.

British Guiana, the only British possession on the mainland of South America, has an area of nearly 90,000 square miles and a population of about 340,000. More than two-thirds of the people are Negroes and Hindu coolies brought in as mine and plantation laborers. The native Indians number only about 8,700; the whites, 10,500. Sugar and molasses, gold, bauxite (aluminum ore), rice, rum, diamonds, timber, balata (a rubber-like gum), and copra are the chief exports. Most of the exports go to Canada and Great Britain, but bauxite is sent principally to the United States and Canada, and diamonds to Belgium, Holland, and Great Britain. Transportation is largely by river and air, for the rugged interior discourages the building of railways and roads, while heavy rains make them hard to maintain. There are 450 miles of navigable rivers, but hardly 100 miles of railways. Passengers and mail are flown between Georgetown, the capital, and Miami, Fla. Georgetown is below high-tide mark and is drained by canals and pumps. Its houses are built on piles. In the interior, the rivers plunge about 5,000 feet in sharp steps to the sea, forming vast waterfalls such as Kaieteur Falls on the Potaro River (for picture, see South America). Also notable are Marina Fall on the Ipobe, and the falls of Mount Roraima, which drop 1,500 feet and which have been called the world's most beautiful cataract. On the estuary of the Essequibo River and 25 miles up the Demerara are United States airplane bases, which were leased from Great Britain in 1940.

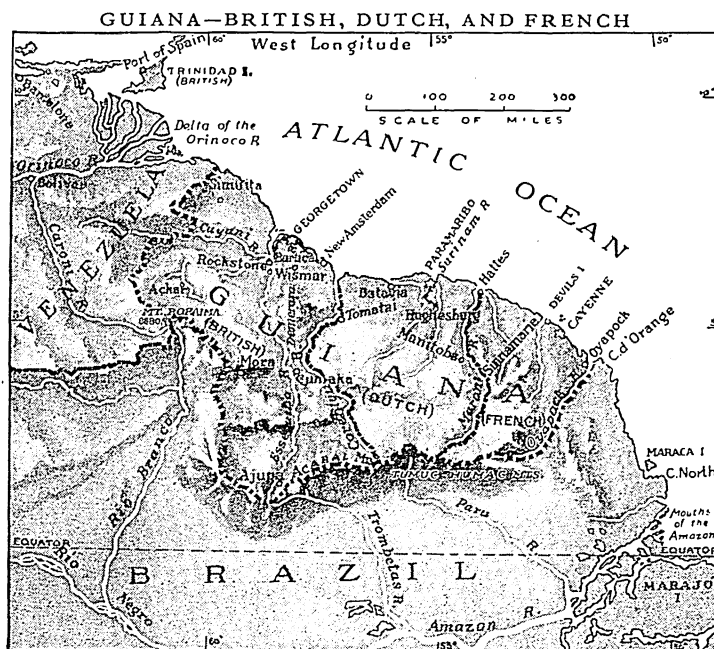
Surinam (Dutch Guiana) was ceded by the British to the Dutch in 1667 in return for the surrender of the Dutch claim on New Amsterdam, now New York. About 54,300 square miles in area, Surinam has an estimated 180,000 inhabitants. Nearly one-third live

in Paramaribo, the capital. Most are mine and plantation laborers, chiefly Hindus, Javanese, Chinese, and Negroes. In the interior are 20,000 "bush Negroes," descendants of escaped slaves. There are about 2,000 whites. To protect the bauxite deposits, which supply the United States with a major part of its aluminum ore imports, United States troops occupied the colony in 1941. Other exports are sugar, rum, coffee, and gold.

French Guiana has an area of about 34,750 square miles with about 37,000 inhabitants. It is

known chiefly for its penal colony, which has existed since 1852. Most of the convicts are kept on the mainland; the more desperate are on islands off the coast. Devil's Island is famous as the place where Capt. Alfred Dreyfus was imprisoned, the victim of an army plot that caused years of political strife in France. A considerable part of the white population consists of convicts and their descendants. There are some roaming Negroes and Indo-Chinese, chiefly mine, plantation, or road laborers, with about 3,000 native Indians in the jungles. Cayenne, on the island of Cayenne, is the capital and seaport. The few exports include gold, sugar, coffee, cacao, and timber. Only a few thousand acres are under cultivation. To develop further the resources of the interior, France in 1930 set it up as a separate colony (30,000 square miles) called the Territory of Inini. This is administered by the governor of French Guiana.

GUINEA-FOWL (*gīn'ī*). The guinea-fowl, originally from Africa, still clings to its wild habits, though it has been domesticated since the days of the ancient Greeks and Romans. It squawks harshly and flies to roof tops or trees when disturbed. It roosts in trees in preference to poultry houses, and its flesh is dark and gamy. The plumage of most guinea-fowls in the United States is purplish gray with white dots.



The map shows how Guiana is divided among the British, the Dutch, and the French. Note its many rivers. They tell you by the direction of their flow that Guiana slopes mainly toward the north. The coast land is a low narrow plain. Here are large plantations, enriched by soil carried down by the rivers. As you travel south, you climb plateaus and tall hills, and finally massive mountains. If you travel by airplane, you will see that most of Guiana is covered with forests.

The wild guinea-fowls are of three kinds—those with a crest of feathers on the head; those with a bony helmet and bare heads; and those with a patch of feathers on the back of the head. The crested variety is more graceful than the others; their plumage is black, dotted with small bluish-white or light green spots. The skin of the neck is bare, bluish in color, and sometimes ornamented with bright red. The helmeted variety, from which the domestic form is derived, go in large flocks. They are very noisy, fast runners, wild and wary. Some species of this kind live also in Madagascar. The domesticated guinea-fowls are of three varieties—pearl, white, and lavender.

Guinea-fowls destroy many insects, their eggs are good, and their flesh is esteemed as a delicacy. But they are hard to raise as they have the bad habit of hiding their nests, and they are unpopular on account of their harsh monotonous cry.

GUINEA-PIG. This restless grumbling little rodent is curiously misnamed, for it is in no sense a pig, and is not native to Guinea, but to Guiana, Bolivia, Brazil, and some other parts of South America. Its real name is the *cavy* and it is related to the hares and rabbits. It was domesticated in Europe in the 16th century, and is frequently seen in the United States. The cavy is about six inches long, and exists in several varieties, some of which have short hair and others long curiously ruffled hair. The colors are varied, usually black and white, tan and white, or a mixture

GUINEA-PIG BABIES



Here are eight of the little youngsters tumbling about—an average family, for the domestic Guinea-pig has from four to twelve young at a time, depending upon the age of the mother.

of all three. The little animals are gentle and amusing and are bred as pets for children. They are also in great demand as subjects for experiment in medical laboratories. They live wholly on vegetable food and while feeding generally sit on their hind feet. When free they live in burrows and feed at dusk and on dark days. The guinea-pig breeds rapidly and is capable of bearing young when but a few months old. Scientific name, *Cavia cobaya*.

AN AFRICAN GUINEA-FOWL



This Guinea-fowl is a native of Africa, where the whole Guinea-fowl family originated. But he is more lean and long-legged than our domestic fowls and is one of the swiftest bird runners.

GUITAR (*gī-tār'*). A stringed musical instrument resembling the lute, well adapted as an accompaniment to the voice in singing and much used in Italy and Spain. It was introduced into Spain by the Moors.

It has six strings, which are played by the fingers of the right hand, while those of the left control the pitch by pressing on the fingerboard, which has frets (metal strips dividing it into notes) across it. The three highest strings are usually of gut, the three lowest of silk spun over with silvered wire.

GULF OF MEXICO. This great oval indentation of the Atlantic Ocean, more than 700,000 square miles in area, is almost completely surrounded by the United States and Mexico. Look at the map and see how the peninsula of Yucatan reaches up towards the downward sweep of Florida as if to hold it in, and how.

in the 450-mile stretch between them, a portion of Cuba interposes, leaving the Straits of Yucatan, 120 miles wide, opening into the Caribbean Sea to the south, and the Straits of Florida, varying from 60 to 100 miles wide, the only passages to the open sea. From east to west the Gulf measures 1,100 miles, and from north to south 800 miles.

The greater part of the 3,000-mile coast line is low and marshy. It is outlined for much of its length by long barren sand-bars, sometimes 100 miles in length, with salt lagoons behind them. There are no islands in the Gulf, except Cuba, a few small ones off the coast of Yucatan, and the luxuriant little Florida Keys. The rivers emptying into it all bring down a great amount of sediment, which forms great bars at the mouth, so that all of them, except the Mississippi, are nearly inaccessible except for vessels of small draught. Because of the low shores there are only a few good harbors, the most important being those of Key West, Tampa, Pensacola, Mobile, Galveston, Corpus Christi, Tampico, Vera Cruz, and Havana. From Florida to the Mexican boundary the slope of the basin is very gradual, but off the Mexican coast it drops rapidly to the submarine plain known as Sigsbee's Deep, which is about 12,750 feet deep. The tides are relatively small in range, as we should expect in such an almost land-locked basin, rarely exceeding 4 feet for the spring tides and 2½ feet for the neap tides.

The Gulf exercises a great influence on the climate of the southeastern states and the whole Mississippi valley, saturating the southerly winds blowing across it with moisture, which falls as rain, most heavily on the coast and in smaller and smaller quantities toward the north. The temperature of its waters is eight or nine degrees higher than that of the Atlantic.

GULF STREAM. In winter, travelers from New York to Bermuda may leave the American shore in a blinding snow storm or bitter cold. During the night, as their ship plows southeastward, they may be tossed by storm or blinded by fogs. But some time next day they are likely to find clear, blue water and milder temperatures, because they have entered the Gulf Stream. This is a tremendous current of warm blue water which flows from between Florida and Cuba, in a general northeastward direction, toward Europe.

At the same time, the peoples of western Europe are enjoying far more important benefits from the Gulf Stream. The British Isles are as near the North Pole as Labrador, and they receive no more heat from the sun. Bordeaux, France, is nearly as far north as Montreal. Yet these and other parts of western Europe enjoy mild winters, while Labrador and Montreal are subjected to intense cold. The difference is caused by comparatively warm winds which blow over western Europe from the warm water brought to its rim by the Gulf Stream and the westerly winds (*see* Climate).

The Cause of the Gulf Stream

As explained in the article on the Atlantic Ocean, the Gulf Stream is one of the great ocean currents which are caused by the same forces that give us climate—particularly the planetary winds (*see* Winds).

The trade winds over the Atlantic Ocean continually drive warm surface water into the Caribbean, and across this sea until the water reaches the Yucatan Channel between Yucatan and Cuba. Here the water can go no farther west because the waters of the Gulf

of Mexico are in the way. The current is forced out, therefore, through the Straits of Florida between Florida and Cuba, a span of not quite 110 statute miles. This is considered the origin of the Gulf Stream.

The stream is then forced northeastward between Cape Florida on Biscayne Key off Miami and the Bahamas. The average flow here is estimated at 14 cubic miles, or 100 billion tons, of water an hour. The average speed is about four statute miles an hour. This part of the Gulf Stream is often called the Florida Current.

Off St. Augustine, Fla., the stream is joined by a similar stream which flows east of the West Indies instead of through the Caribbean. The united stream then trends northeastward, under the influence of the prevailing winds and the rotation of the earth. It passes about 35 miles out from Cape Hatteras, but thereafter is kept from the coast by the so-called *cold wall* of off-shore water. The surface temperature is about 88° F. in summer and 79° in winter.

Near Cape Hatteras the stream divides. One branch starts curving east and southeast; the main current flows northeast to the Grand Banks of Newfoundland. The temperature here averages about 72° F. in summer and about 50° in winter. The speed, however, has dropped to between 24 and 30 miles a day; and thereafter the stream forms part of the North Atlantic Drift of water toward Europe.

The Gulf Stream was recognized in the South by the early Spanish explorers. Its name first appeared on a chart engraved for Benjamin Franklin.

LONG-DISTANCE *Flying Champions of the* WORLD

GULLS AND TERNS. Long before airplanes ever winged over the ocean, gulls and terns were making transatlantic flights. Travelers declare that the same bird has followed their vessel the entire 2,500 miles from Ireland to New York, living on refuse thrown out from the ship, and occasionally resting on the waves. Bird banding furnishes more reliable evidence. Terns tagged in Labrador have been picked up in France and South Africa. Gulls banded in Germany and England have been found all the way from Labrador to Mexico.

Most of the gulls and terns migrate enormous distances between their winter and summer homes. The record for long-distance traveling in the bird world goes to the Arctic tern, which makes an annual round trip of 20,000 miles. It nests in the Arctic regions, and as soon as the young are grown the whole family departs for the Antarctic Continent. As one would expect in birds capable of such flights, their



Those strong, tireless wings carry the Tern over oceans, and from Arctic to Antarctic. With wide open beak it screams its harsh, resounding *tee'arr, tee'arr*.

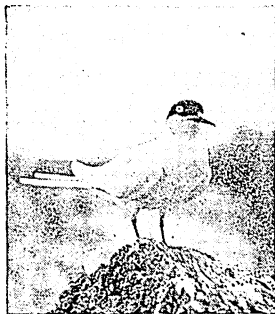
wings are long and powerful, so that they can make steady headway against the strongest gales. They have webbed feet, so that they are at home in the water and swim easily. Most of them are sea birds, but several species live and breed on inland lakes and marshes. They are exceedingly sociable and nest in colonies of thousands, sometimes millions.

Gulls and terns are widely distributed, with some 50 species of each scattered throughout the world. In the United States these beautiful birds were once threatened with extermination by hunters, who sought their plumes and edible eggs. Thanks to protective laws, however, they are again increasing in numbers.

Gulls vary from the size of a pigeon to that of a goose. Terns are slightly smaller, with slimmer bodies. The prevailing color of the grown bird is white below and pearl gray above. In some species the head, wings, and tail are marked with black in summer months.

A few species are dull gray all over. The feet and bill are usually bright yellow or red.

All gulls and terns are fond of fish, and greedily eat dead ones as well as any food refuse found floating on the water; thus the harbor and shore gulls are valuable scavengers. Inland gulls are valuable friends to the farmer because they eat field mice and the insect pests which do such harm to crops and trees. In Salt Lake City a monument, surmounted by bronze figures of two gulls, has been erected "in grateful remembrance" of the service rendered the state of Utah by gulls when, in 1850, the gulls came in



This is a Roseate Tern. This species of "sea swallow" is among the largest members of the family.

large flocks and destroyed millions of black crickets, whose ravages for three years had threatened not only the crops but even the very lives of the settlers. (For illustrations in colors of common tern or "sea swallow" and herring gull, see Birds.)

The herring gull is the species most abundant along the Atlantic coast, acting as scavenger in the harbors and following ships for scraps of food. It is very fond of clams, which it breaks open by dropping them from a height on the rocks. One case has been observed where a gull repeated this performance 14 times before the shell finally broke.

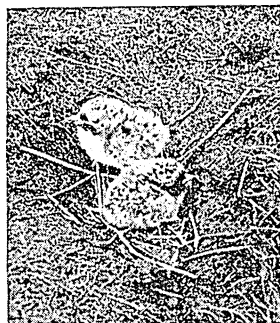
The California gulls are found not only along the coast of California but inland as far as Utah. It was this species that rid the Salt Lake country of its crickets. The birds nest about inland lakes and follow the irrigating ditches, often in company with the ring-billed gull, which is one of the commonest western varieties.

Franklin's gull is the common gull of the lakes and marshes of the upper Mississippi valley. These birds often follow the plow of the farmer, picking up worms and grubs, so he calls them his "prairie pigeons." Their nesting habits differ from those of other gulls. In great companies they seek marshy lakes, where they build floating nests only a few feet

apart. The fledglings swim from the nest when only a few days old, making the lake fairly alive with floating puff-balls.

The laughing or black-headed gull, found near the salt marshes of the Middle and Southern states, is a handsome bird with a black mantle and a white breast flushed with rose. It is noted for its loud laughter-like cry, and for its trick of alighting on the pelican's head and snatching fishes from its huge beak.

It is easy to tell terns from gulls, if you look closely at them. The terns are smaller and slenderer, and are more graceful in



Here you see two little Arctic Terns just hatched, and beginning to move about and take interest in life.

HOW THE TERN TURNS HER EGGS



Mother birds turn their eggs from time to time so that all parts will be equally warmed, but instead of first snuggling down on the eggs and then shuffling them about as hens do, the Least Tern rolls them around under her with her beak.

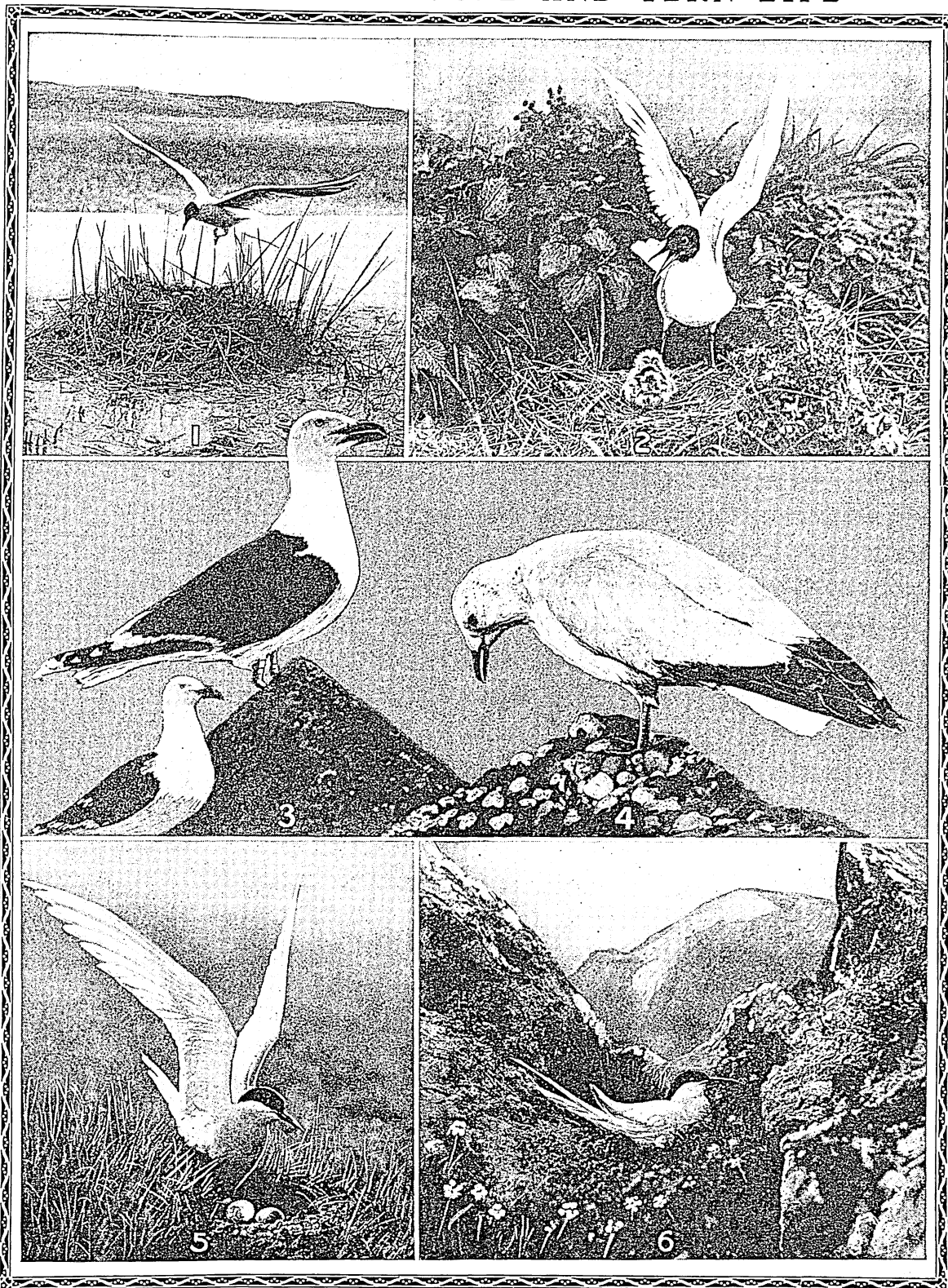
flight, as their nickname "sea swallows" indicates. Gulls usually have square tails, while most terns' tails are forked. A surer distinction is the upper bill, which is always ridged and hooked in the gulls. Their habits also differ, for gulls often alight on the water to feed, while terns always hover and plunge for their food. Another distinction is that gulls usually fly with their bills on a line with the body, while terns carry theirs pointed downward.

The common tern is found in all parts of the Northern Hemisphere, as well as in South America and Africa. They often hover over schools of fish, and fishermen find them of great service in the locating of fish for them. The royal tern is not only the most conspicuous of the family, but is one of the handsomest. It is entirely white or pearl gray except for its glossy black crest, black legs, and a bright orange-colored beak.

The least tern is the daintiest of all sea birds. Only about nine inches in length, it is a pale blue color above and white beneath. But its slender pointed wings and tail made it a prey to the feather hunters, who brought it so close to extinction that it will be long before it recovers its losses.

Gulls and terns compose the family *Laridae* of the order *Charadriiformes*. Scientific name of herring gull, *Larus argentatus smithsonianus*; common tern, *Sterna hirundo hirundo*.

SNAPSHOTS OF GULL AND TERN LIFE



1. The Black-Headed Gull, a resident of Europe, returns to her nest in the marshes. 2. A mother Black-Head screams with rage as the photographer snaps her chick. 3. The Great Black-Backed Gull and his mate survey the Arctic scene. 4. The Herring Gull looks for a bite to eat. 5. The Arctic Tern may choose a grassy spot or a sandy beach for its nest. 6. The Roseate Tern, nesting in the low grass of a rocky shore, may be identified by the delicate rose flush that spreads over its neck and breast.

GUMS AND RESINS. Natural gums, of which about 150 kinds are used commercially, are the solidified juice or sap of certain plants. True gums are soluble in water or absorb water, but do not dissolve in alcohol. The word gum, however, is applied also to true resins and mixtures of gum and resin (*see* Resins). The United States imports about \$10,000,000 worth of gums and resins yearly.

Gum arabic, from the acacia (*see* Acacia), comes to market in the shape of tears of a more or less transparent reddish or light straw color. It is used in medicines, mucilage, calico printing, water-color paints, calcimine, and matches; in various kinds of confectionery; and also for sizing fabrics and giving luster to silks. Gum tragacanth, a hornlike substance from Asiatic shrubs of the bean family, takes up many times its weight of water and so makes a thick mucilage. Tragacanth is used as a soothing agent for a sore throat; for stiffening fabrics, in cigar manufacture, and for thickening mordants and colors in calico printing. It is sometimes adulterated with a cheaper gum, bassora.

Copal resins make the best varnishes. Kauri gum, from the kauri pine of New Zealand, is dug from old deposits, as are the copals of Zanzibar and the Congo, but in Sierra Leone and the Philippines copal is tapped directly from the trees. The sweet-smelling balsam of Tolu, from Colombia, Venezuela, and Peru, and the balsam of Peru, from San Salvador, are oily or "oleo-resins," and are used in perfumes and healing preparations. Canada balsam, obtained from a tree of Canada and northern United States, is an oleo-resin used chiefly in mounting microscopic specimens and cementing glass parts together in optical work.

Gum mastic, from a Turkish island in the Aegean Sea, is a resin used in making a brilliant varnish. Dragon's blood, a red resin used by photoengravers, is obtained from the ripe fruit of several Siamese and East Indian palms (*see* Engraving).

Synthetic gums and resins are better than the natural forms for many purposes. Bakelite is one synthetic resin. (*See also* Amber; Camphor; Chewing Gum; Coal-Tar Products; Opium; Rubber.)

GUMWOOD. Most of the furniture made today contains some gumwood, which is cheaper than such popular furniture hard woods as walnut, mahogany, maple, or oak. The gumwood or some other soft wood is used as a base over which a veneer of hard wood is laid, or else the gumwood alone may be sawed and

stained to resemble a hard wood. Red gum, or sweet gum, when quarter-sawed has the figure of mahogany and can be stained so that it is easily mistaken for the more costly wood. It also is stained or painted to resemble oak, cherry, walnut, or maple, and is widely used as a substitute for the expensive Circassian walnut. The wood tends to warp, but this difficulty is overcome by expert seasoning and cutting. Large quantities are exported to Europe, where red gum ranks second only to oak in the manufacture of furniture.

The wood of the black gum and of the tupelo gum is classed as gumwood, although the trees are not gums but tupelos. Tupelo wood is harder and heavier than

red gum, and it also is widely used in the United States for furniture and cabinet work. (*See* Furniture; Veneer and Plywood).

GUNPOWDER. We do not know when gunpowder was invented. In fact, it cannot be said to have been invented by any one man, for it was a gradual development from various "fire" substances, long known in many countries before they were adapted to military use.

The Chinese early had a knowledge of some such inflammable substance; and "Greek fire," first used by the defenders of Constantinople against the Saracens in 673, is believed to have been similar to modern gunpowder. It was not employed to propel balls, however, but was simply set on fire and poured or hurled on the besiegers beneath the walls. The English Franciscan friar, Roger Bacon, late in the 13th century, and the German monk, Berthold Schwartz, early in the 14th century, were the first to describe the composition of gunpowder. The use of

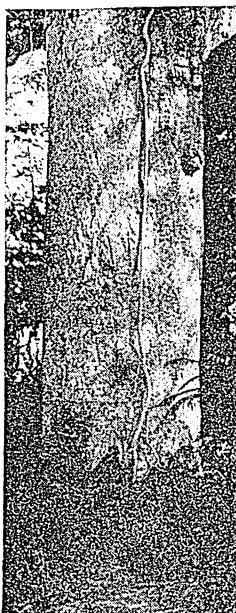
it in cannon is first mentioned in 1326 in the records of the city of Florence. One chronicler says cannon were used in the battle of Crécy (1346); but they could have done little more than frighten the horses and men.

The first important service of gunpowder was in blowing up or battering down the castle walls of rebel barons, who thus could no longer shut themselves up in castle fortresses and defy their king and the rest of the country. Later it was used in small arms, helping to make the common man with a musket more deadly

in war than the mounted knight in armor.

The gunpowder of the early days was much the same as the common black powder of today. It consisted of a mixture of saltpeter (potassium nitrate or niter), charcoal, and sulphur. The proportions of these chemicals have varied greatly from time to time, a

THE KAURI TREE



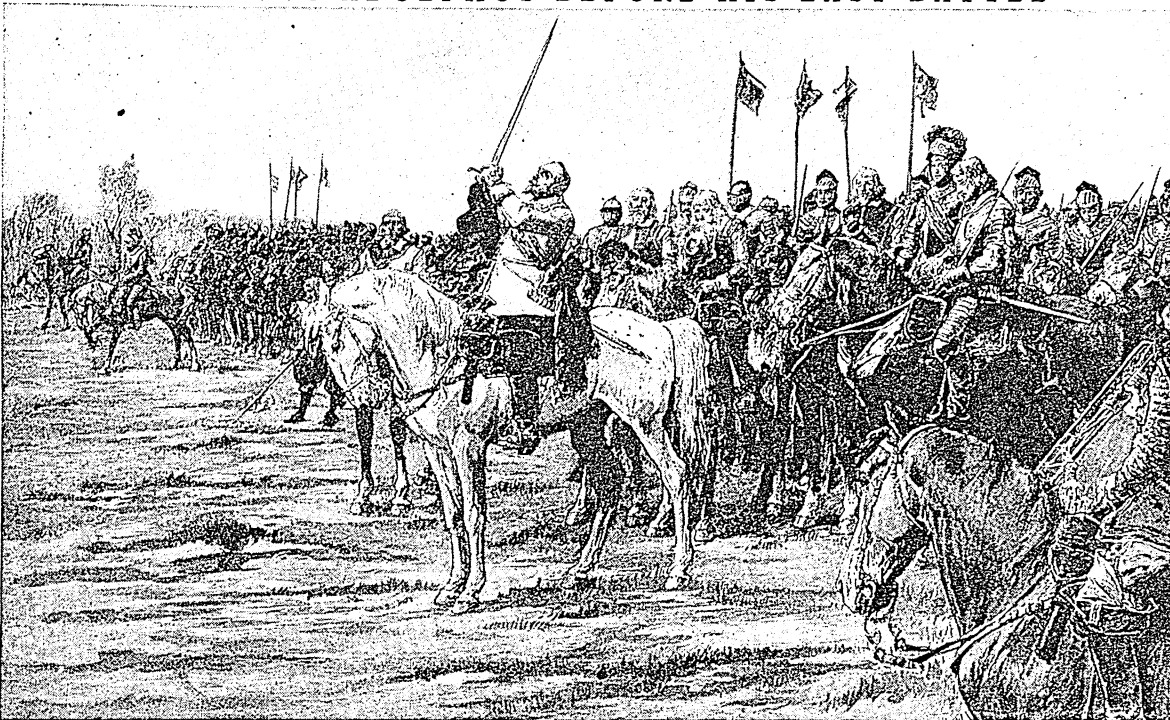
Kauri gum comes from the giant kauri tree of New Zealand, which is one of the largest of all trees. The men are digging chunks of the fossilized gum.

fair modern standard being 75 per cent saltpeter, 15 per cent charcoal, and 10 per cent sulphur. These ingredients are ground to a fine dust, thoroughly mixed into a moist paste, pressed into cakes, and dried. The cakes are then broken by rollers into grains of varying size, which are glazed by friction against each other in revolving barrels. The charcoal used in gunpowder is specially prepared from dogwood, willow, or alder. All operations are carried

Adolphus, king of Sweden, one of the greatest generals of modern times.

Born in Stockholm castle, he had been trained from childhood for his kingly duties. When he was only nine years old he began to take part in public affairs, and in 1611, at the age of 17 he had mounted the throne as Gustavus II. So carefully had he been trained that before he was 20 years old he had won a war against Denmark, and by 1630 he had

GUSTAVUS ADOLPHUS BEFORE HIS LAST BATTLE



Gustavus Adolphus is praying for divine aid just before the Battle of Lützen. His army scored a brilliant victory, but the great king was killed. Near the spot where he fell a granite bowlder was placed on the day after the battle and in 1832 a cast-iron canopy was built over it.

on in small separated buildings so that the danger of great destruction by accidental explosions is reduced to a considerable extent.

Except for blasting work and certain special military purposes, the old style gunpowders have been almost entirely replaced by the smokeless powders and the high explosives, such as guncotton, nitroglycerin, and dynamite (*see* Dynamite and Nitroglycerin; Explosives). Smokeless powders (products of guncotton and nitroglycerin) were first perfected in 1884 and put to military use by the French.

GUSTAVUS ADOLPHUS, KING OF SWEDEN (1594-1632). For 12 years in the first half of the 17th century Germany had been devastated by the Thirty Years' War. Towns had been destroyed, men, women, and children massacred, and the country plundered. Everywhere the Catholic and imperialist party was triumphant, and it seemed as though the Protestant faith would be swept out of the land. But in 1630 the tide was completely turned by the appearance of a new leader for the Protestants—Gustavus

extended his kingdom around the whole eastern shore of the Baltic by successful struggles with Russia and Poland.

Gustavus Adolphus was led to enter the Thirty Years' War not only because he was an enthusiastic Protestant, who hoped to relieve the misfortunes of the Protestant cause in Germany, but also because he dreamed of extending his kingdom even to German shores, so that the Baltic might indeed become "a Swedish lake." France under Cardinal Richelieu as minister gave him money for his expedition, to further French political aims.

When Gustavus landed in the north of Germany his army was not large, but it was well trained and disciplined. He was the greatest military genius of his age, being the first of modern commanders to supply his army from a fixed base instead of leaving it to live off the country by foraging and pillage. At first he was coldly received by the Protestant rulers of Brandenburg and Saxony, but they were brought to their senses after the awful destruction of

Magdeburg by the imperialist forces and the foolish religious policy of Emperor Ferdinand II. In the famous battle of Breitenfeld, near Leipzig (Sept. 17, 1631), Gustavus overwhelmingly defeated the imperialist army under its famous commander Tilly.

Gustavus then pushed westward, through the "priests' lane" of rich bishoprics and monasteries of the river Main, to Mainz on the Rhine, where he established his brilliant winter court. In the spring he again took the field, and a second time defeated and now mortally wounded the aged Tilly in Bavaria. In this emergency the Emperor took the humiliating step of recalling the imperialist general Wallenstein, whom he had dismissed just after Gustavus had landed on German shores.

After weeks and months of maneuvering, one foggy day in November 1632, Gustavus succeeded in bringing Wallenstein to bay at Lützen, only a few miles from the site of his first great triumph. Again the Swedish troops gained the victory, but the battle was won at the cost of the life of their beloved king, for Gustavus fell wounded into the hands of the enemy and was dispatched as he lay. He was the greatest king that Sweden ever had. With his death "all moral and religious ideals died out of the Thirty Years' War," and it became a mere struggle for political power. (See also Thirty Years' War.)

GUTTA-PERCHA (*güt'a-pēr'cha*). Most of the ocean cables which link the nations of the world are covered with gutta-percha, the juice or milky latex of a tree which grows in the Malay Peninsula, in Borneo, Java, Sumatra, and the Philippine Islands. It is more familiar to us in the rubber-like covers of golf balls, in some knife handles, in adhesive and waterproofing materials, in protective clothing for chemical workers, in dental packing and dental plates, and in certain kinds of surgical instruments. It makes the best cable covering because it is tough, strong, and stable under water, and is highly insulating. It is sometimes used as a substitute for rubber, or is mixed with rubber to make the rubber plastic.

Like rubber, gutta-percha is gathered from cells in the cortex of the trunk and branches of the tree, which must be about 30 years old before it is ready to tap. A tree may give from a few ounces to three or more pounds at a tapping, mostly from the higher parts of the trunk. The gutta is washed free from dirt and bark, and molded into compact slabs by being immersed in hot water and kneaded with the hands. Gutta is stored under water to prevent oxidation, which makes it brittle.

Cultivated trees give the best yield. Some can be tapped more than once, at intervals of perhaps two years, so the native method of felling the tree to collect the gum is wasteful, and the Malayan government attempts to prevent it. Tapping provides the best gutta, but it may also be obtained from the leaves, twigs, and the ends of the smaller branches by cutting, grinding, and boiling. The gutta separates in the boiling and rises to the top.

Rubber, balata, chicle, jelutong, and other products are all related to gutta in general chemical composition, and all come from tropical plants. Gutta, unlike rubber, is not elastic, but it is plastic when warmed and can be molded or rolled into sheets.

The gutta-percha tree grows in scattered patches among other trees, generally near the coast. The long, narrow, pointed leaves of smooth dark green have small white blossoms near the ends of the branches. True gutta-percha comes from the tree *Palaquium oblongifolia*, of the family *Sapotaceae*, though many other species contribute to commercial gutta-percha.

GYPSUM. The abundant mineral, gypsum, is composed of calcium sulphate in combination with water. Translucent varieties are known as "selenite," and very fine grades of the material, of white color and special luster, are known as "alabaster," valued for making statuary and ornaments. This is not to be confused with the alabaster of ancient times, which was a fine marble used for vases and ornaments. Most commercial gypsum occurs as rock gypsum, which is mined from thick beds like those of coal. Some surface deposits are found, others occur far below the surface. Gypsum beds hundreds of feet thick are found in west Texas over hundreds of square miles.

Ocean water contains much gypsum. Most gypsum has been formed by precipitation from water that was cut off from the sea and later dried up. Large crystals of selenite are sometimes found in caves, as in the Mammoth Cave in Kentucky. Many so-called "hard" waters contain calcium sulphate.

Gypsum has been used as a plaster and building material since early Egyptian times. When heated it loses part of its water of crystallization, but if it is then mixed with water, it becomes plastic and takes up the water again, re-crystallizing to form a soft yet rigid cement-like material. Alone or mixed with sand or lime, this can be molded into casts, stucco, tiling, or finishing plasters; or made into lath, wallboard, or blocks. Stage and motion-picture settings, and similar temporary structures, are made of gypsum wallboard and plaster of paris, as are the casts used by sculptors, surgeons, and dentists.

A mixture of gypsum plaster with a little cement, dextrin, and tow (coarse flax or hemp) to give it strength, forms a light building material called "staff," which is much used in constructing temporary buildings. The material is so light that wood instead of steel framework may be employed.

Gypsum wallboard and tiling resist fire and water well, and they insulate a building against both heat and cold. Such boards or blocks can be nailed and sawed like wood, replacing wood for so many uses that the production of gypsum has recently more than doubled. Artificial gypsum, formerly a waste product in phosphate fertilizer manufacture and other chemical industries, is used in making building tile.

In the United States gypsum deposits are worked in New York, Iowa, Michigan, Kansas, South Dakota, Texas, and in many other states.

The SPINNING TOP that GUIDES SHIPS

GYROSCOPE. The spinning of a top, the rotation of the earth on its axis, the whirling of a rifle bullet point-first toward its target, the long sailing flight of a "spiral punt" down a football field—these are all common illustrations of that peculiar phenomenon that scientists call *gyroscopic force*. Suitably harnessed, this force will keep an airplane flying straight and level without a hand on its controls, or guide a ship on its course despite wind or waves, or permit a railway car full of people to run straight or around curves at high speed while balanced on a single rail.

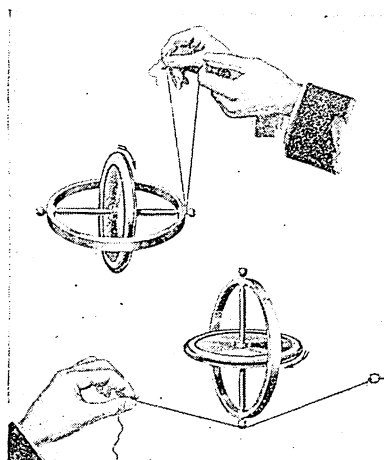
Any object spinning around its axis will develop gyroscopic force, but the best illustration of the principles involved is provided by the toy gyro-top,

right angles to the direction in which you push it. If you try to force it around horizontally to the right or the left, it will move up or down; and if you try to push it up or down, it promptly moves horizontally.

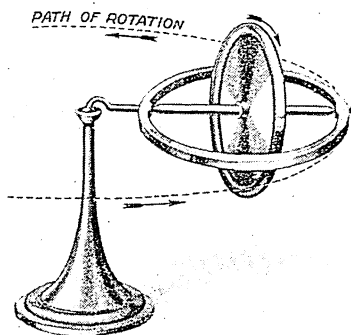
Thus you have illustrated the two great gyroscopic principles which apply to every rotating body. First, it has *rigidity in space*, which tends to keep its axis pointing continuously in the same direction; and, second, when this space rigidity is disturbed, the rotating body tends to turn so that points on its rim will be moving in the same direction as the disturbing force. This last is called the principle of *precession*.

This explains why spinning tops stay erect and why planets or rifle bullets do not turn end-over-end

SOME OF THE QUEER ANTICS OF THE GYROSCOPE

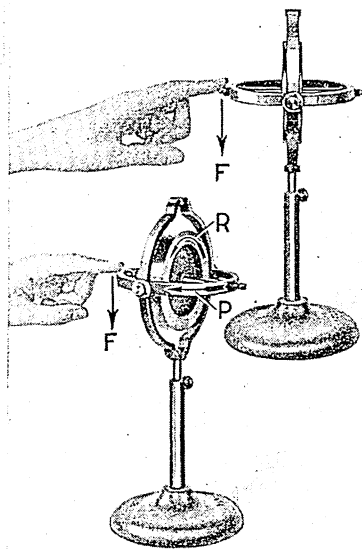


Here is demonstrated the gyroscope's tendency to "stay put" in the position in which it first starts spinning. At the left a toy gyro-top is standing out horizontally although only one end is supported by the string. A second top is securely "walking a tight-rope." Below we see what happens when we disturb the "rigidity in space," as it is called, of a small laboratory gyroscope. Instead of tipping when pressed down lightly, it turns around its vertical axis in the direction shown by the arrow P. This effort of the spinning wheel to get around so that its edge will be moving (arrow R) in the same direction as the finger pressure is called "precession." A case of continuous precession is shown at the right, where a spinning gyro-top whose free end is being subjected to the pull of gravity turns round its supporting stand, like a dog chasing its tail.



which is essentially the same as the common laboratory gyroscope. This consists simply of a heavy wheel with its axle pivoted inside a ring. This ring in turn is pivoted in a gimbal frame as shown in the picture in the middle of this page. Such a mounting permits the wheel to be tipped and turned in every possible position and direction.

So long as the wheel is not rotating it offers, of course, virtually no resistance to being tipped and turned. But now let us set the wheel spinning by winding a string around the axle and then pulling it away sharply. Immediately, the gyro-wheel seems to become imbued with a strong and perverse will of its own. Pick up the stand and walk around with it. No matter which way you turn, the axle will continue pointing in the direction it had when it started spinning. Set the stand back on the table and try with your finger to push the end of the axle out of its position. Not only will it resist you, but it will stubbornly move at



in flight. Also it explains how the earth, under the conflicting attraction of other heavenly bodies, wobbles slowly on its axis, producing among other effects what is called the "precession of the equinoxes" (see *Earth; Equinox*).

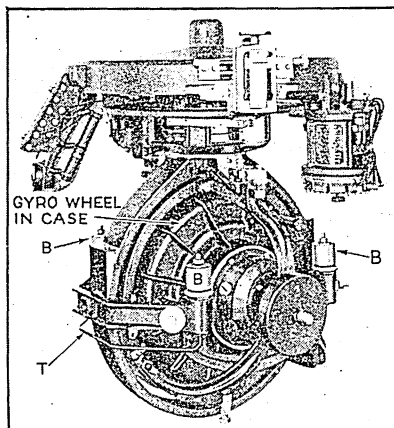
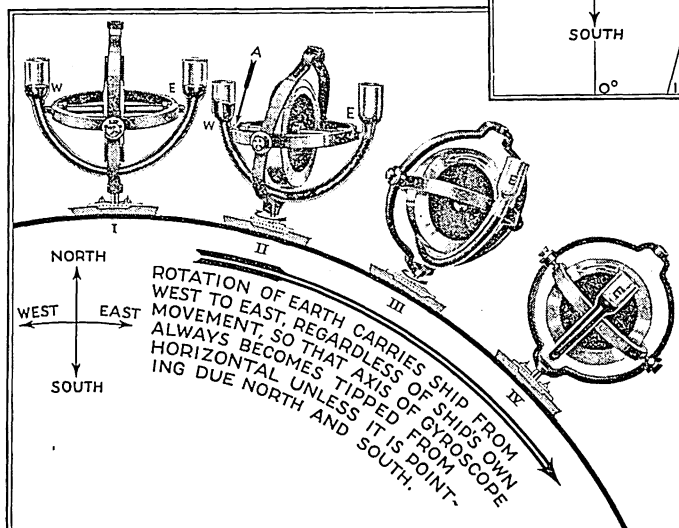
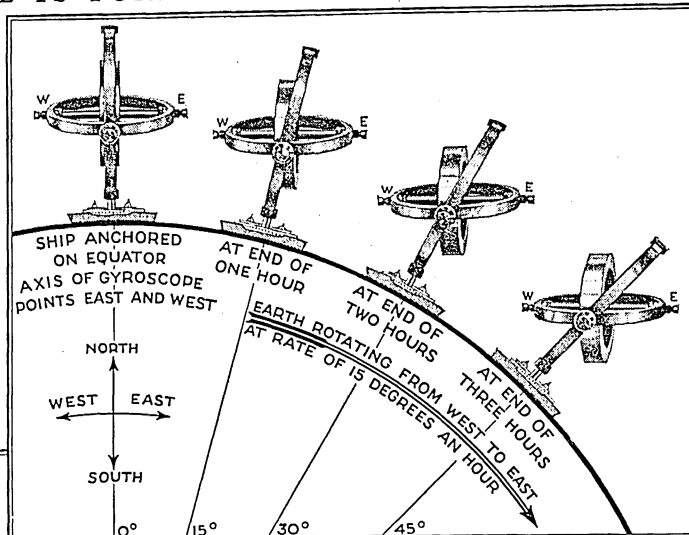
In practical use, gyro-wheels are usually electrically driven. When well balanced they are sensitive to extremely small changes in position. Hence their great value as automatic gauges and controls. A gyroscopic recorder aboard a speeding railway car will trace on a paper roll an accurate line showing every fault in the level of the tracks. Huge gyroscopic stabilizers

prevent ships from rolling with the waves, while other craft which have to break their way through ice are made to roll by oscillating gyro-wheels.

The "turn-and-bank" indicator on many airplanes is a simple gyroscopic device which tells the pilot flying through darkness or fog when his ship gets off its straight and level course. The "mechaviator" is a

HOW A GYROSCOPE IS TURNED INTO A COMPASS

To understand the picture at the right imagine yourself suspended in space and looking at the earth from south of the Equator. A giant gyroscope aboard a ship is being carried around by the earth's rotation. The gyro-axis W-E points east and west. For the sake of simplicity in picturing angles, we have anchored the ship on the Equator, although, as the next picture shows, the ship's position or motion would make little difference. As the gyroscope is carried around, note that its "rigidity in space" holds the wheel parallel to its original position, so that the W end of the axis, still pointing west, dips more and more toward the earth. Now study the picture below. The original conditions are the same, except that a U-tube with enlarged ends, containing mercury, has been fastened to the axis supports of the wheel's frame. As soon as the west end of the axis starts to dip toward the earth, the mercury under the leveling force of gravity flows to that side of the tube. This results in a greater downward pressure on the



In this Sperry compass, the gyro is part of an electric motor and is kept spinning about 6,000 to 8,000 times a minute inside its case. A pair of mercury containers B on each side correspond to the ends of the U-tube in the previous picture. The tube T connecting each pair is so small that the mercury will not flow rapidly back and forth as the ship rocks, but will respond only to prolonged tipping of the gyro-axis. When this happens, the gyro precesses, and the motion is communicated by its vertical supporting ring through electrical contacts to an auxiliary motor which keeps the compass card aligned properly with the gyro.

west end than on the east end of the axis. Precession, as illustrated with finger pressure on the previous page, sets in; and what was the west end of the axis turns toward the north. The turning continues until the mercury is balanced in the U-tube, a condition that can only exist when the axis of the gyro and the axis of the earth are in the same plane, or, in other words, when the axis of the gyro points in exactly a north-and-south direction. For purposes of illustration, the angles assumed by the gyro in the pictures have been greatly exaggerated.

ity to a gyro-wheel so that the axis of the latter will always seek the north-to-south line is explained by the accompanying pictures. Gyrocompasses are now the standard equipment on all large ocean-going steamers since they are free from the faults of the older magnetic compass (see Compass, Magnetic). The gyro-pilot, which sailors call "Metal Mike" or "Iron Quartermaster," is an automatic steering mechanism connected to the master compass. It corrects each small drift or yawing of the vessel, holding it more closely to its course than could any human helmsman (see Navigation). The controlling mechanism can be disconnected whenever it is necessary to steer by hand, as in passing ships or entering harbors.

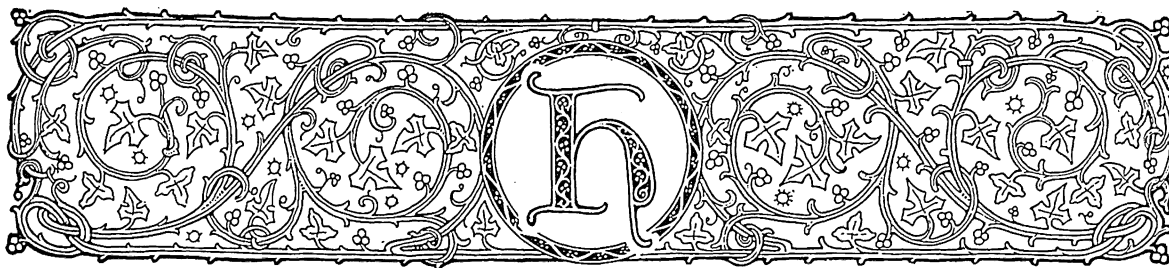
Gyroscopes are used in naval warfare to hold torpedoes pointing steadily at their mark. One type of monorail car, which has proved experimentally successful, is kept upright on its single track by

more powerful device connected to the controls so that the plane's dips and turns away from the course are automatically corrected.

In 1911 Elmer A. Sperry, of Brooklyn, demonstrated the practical value of his now famous gyrocompass. How this device manages to harness the force of grav-

a double set of gyro-stabilizers.

The first gyroscope was suggested in 1836 by Edward Sang as a device to illustrate the motions of the earth. Jean Foucault actually made one in 1852, and gave it its name, at the same time starting the studies upon which our knowledge of its action rests.



HABEAS CORPUS (*hā'be-as cōr'pūs*). When a person is imprisoned or held anywhere against his will, a court of law may upon reasonable demand issue an order compelling the jailor or other custodian to produce the person in court and show by what right he is held captive. If no lawful reason is found the prisoner is released. This court order is called a writ of habeas corpus, often known as "the great writ of liberty." It is probably the most important of all legal safeguards against tyranny.

Habeas corpus is a Latin phrase meaning "produce the body." The principle of this writ is of ancient English origin, for in Magna Carta King John was forced to promise that "no free man shall be taken or imprisoned except by the lawful judgment of his peers and by the law of the land." Under this principle no one could be arrested and held in confinement on mere suspicion, without being formally accused of a crime.

This remained one of the mainstays of English liberty until Charles I set up the claim that a royal command was a sufficient answer to a writ of habeas corpus. This misguided policy with similar arbitrary acts cost the king his life. The result was that under Charles II the famous Habeas Corpus Act was passed, which extended the principle to mean that any person who was imprisoned for any crime except treason or felony, could demand and obtain his freedom under bail—that is, the pledge or bond of some responsible person to pay a fixed sum of money if the accused person failed to appear for trial.

The amusing manner in which this law passed the House of Lords is told by Bishop Gilbert Burnet in his memoirs. The lords who approved the bill had all filed out, as is customary when voting, and were returning to be counted as they entered the door, "Lords Gray and Norreys were named to be tellers," says Bishop Burnet. "Lord Norreys, being a man subject to vapors, was not all attentive, so, a very fat lord coming in, Lord Gray counted him for ten, as a jest at first; but seeing Lord Norreys had not observed it, he went on with this misreckoning of ten, so it was reported that they who were for the bill were the majority, though it indeed went to the other side."

The Constitution of the United States declares that the "privilege of the writ of habeas corpus shall not be suspended, unless, when in cases of rebellion or invasion, the public safety may require it." The privilege was suspended by President Lincoln during the Civil War, at first without the sanction of Congress. In 1863 Congress voted to give the President that power.

HABIT. The ordinary person thinks of smoking, chewing gum, or personal peculiarities such as holding one's head on the side, as habits. He does not think of walking, skating, and catching a ball as habits, nor of the movements of his eyes in reading, or of his hands in playing a piano. Habit enters so largely into man's daily activities that it would be impossible for him to exist without it. He could not communicate with a friend without making use of the habits of enunciation or writing that he formed with great difficulty in childhood. If he had not made it a habit he might be occupied all day in dressing and undressing himself, for the fastening of a button or the combing of his hair would be as difficult as when he first tried it as a child. He would, moreover, be completely tired out from his exertions. But habit enables him to do these things speedily and accurately, yet almost unconsciously, and so leave his mind free for other matters.

Habit formation has been likened to the making of a path across a field. After the first traveler has trodden down the grass, the next is likely to follow in the same route, and so on until presently the grass is wholly worn away and everyone thereafter follows the beaten path. In the same way in the animal organism, nervous currents tend to employ those pathways which have been previously established, and thus many of our habits formed when we are young—such as posture, personal cleanliness, manners, and standards of dress, enunciation and tone of voice, and even moral habits—become permanently settled upon us. Prof. William James has told us of the drunken Rip Van Winkle who excused himself for each fresh relapse by saying, "I won't count this time." "He may not count it," says James, "but it is being counted nevertheless. Down among his nerve-cells and fibers the molecules are counting it, registering and storing it up to be used against him when the next temptation comes." To break up a habit means a complete change in the nervous system, and this can not be brought about solely by a penitent attitude of mind.

It is equally important for parents to remember that habits originate not only in conscious effort to do new things, but in conscious and unconscious imitation of what the child sees and hears about him. One of the main businesses of life is the formation of correct habits, for habits are the substance of conduct and character. To each of us comes the day when we realize the "law of human souls that we prepare ourselves for sudden deeds by the reiterated choice of good or evil that gradually determines character."

HADDOCK. A member of the cod family, resembling the common cod, but easily distinguished from it by the black lateral line, that of the cod being white. Though it usually ranks as inferior to the cod, it is nevertheless, one of the world's great food fishes. It is caught on the same grounds and by the same methods as the cod. "Finnan haddie" is smoked haddock. (*See Fish*).

HADES (*hā'dēz*). When the three greatest gods of Greek mythology, so the story goes, divided the world among themselves, Zeus obtained dominion over the heavens and upper regions, Poseidon became ruler of the sea, while Hades gained sovereignty over the underworld. Here in the realm of darkness Hades sat enthroned with his wife Persephone and ruled the spirits of the dead. He possessed a helmet which rendered him invisible. The Greeks pictured him as of stern and gloomy aspect, not to be moved by prayers and flattery. No temples were dedicated to him and when sacrifices were offered to him the ceremonies were dismal and only black animals were used.

So hated and feared was Hades as the god of the dead that the Greeks dreaded to call him by his real name. In later times they gave him a more kindly character and called him Pluto, "giver of wealth," for they believed that he controlled all the precious minerals that lay hidden in the depths of the earth, and even the grain that springs forth from the ground.

The term Hades came to be applied also to the abode of the dead. This was generally thought of as a place where the souls of the good and the evil alike led a dim shadowy existence, though there also grew up the idea of Elysium or the Elysian Fields, a paradise for those deserving special reward, and Tartarus, a deep pit under Hades where the wicked dwelt in eternal torment. Before passing into Elysium, souls drank of the waters of Lethe, the river of oblivion, that they might forget their sorrows.

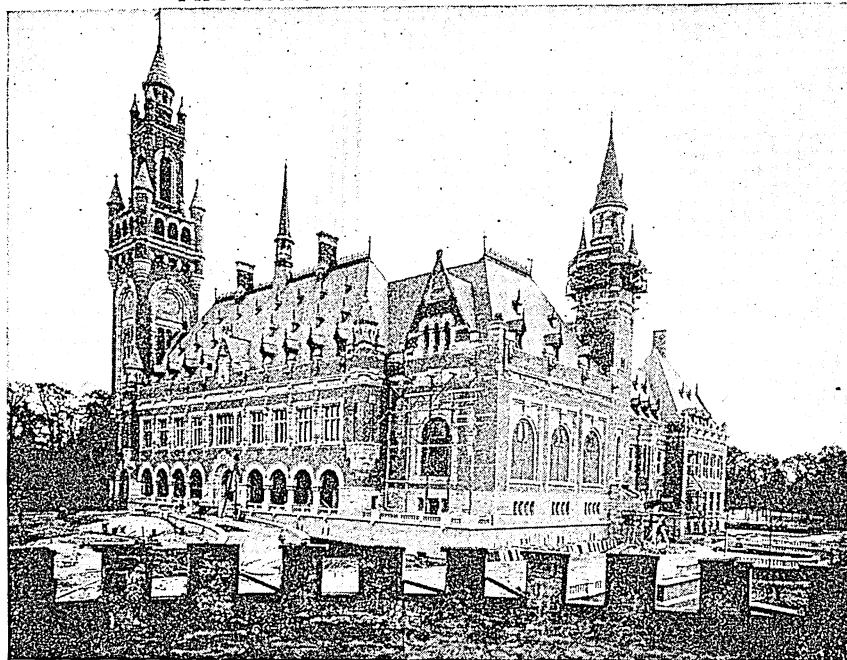
To enter Hades, the dead were ferried across the River Styx by the boatman Charon. Only those who had received proper burial were allowed to go across, and if a body remained unburied, the shade must wander on the bank for 100 years before crossing. On the farther side of the Styx stood the many-headed dog Cerberus, guardian of the realm of Hades, who kept any who entered from returning.

HAGUE (*hāg*), THE. The third largest city of the Netherlands and its governmental center, The Hague lies in South Holland about two miles from the North Sea. It has been the seat of the legislature and the High Court since the 16th century. But Amsterdam is considered to be the capital (*hoofdstad*, or "head city") because the constitution requires that the king or queen be crowned there.

The Hague is normally the royal residence, and it was for long the diplomatic capital of Europe. Since 1899 it has been the seat of the international court of arbitration, or Hague Tribunal, for which Andrew Carnegie built a splendid palace.

The original Dutch name of the city was "sGravenhage" ("the count's hedge"), which is shortened to "den Haag." The name comes from the fact that long ago the counts of Holland had a hunting lodge there. The city was once in a heavy wood, most of which has now been cut down. Only a little patch is left between The Hague and Scheveningen, the most popular seaside resort of the country.

THE PEACE PALACE AT THE HAGUE



This beautiful building, erected to house the Permanent Court of Arbitration, is also the home of the Permanent Court of International Justice (the "World Court"), which was established in 1920 by the League of Nations.

Broad shaded streets, intersected by many picturesque canals, and fine old buildings make the city one of the most attractive in all Europe. Its greatest pride is in its celebrated picture gallery, the Mauritshuis, which has many beautiful and world-famous pictures. Here are masterpieces by the Dutch and Flemish artists, Rembrandt, Rubens, Van Dyck, Vermeer, and others. There is also a very fine gallery of modern paintings which were collected by the eminent Dutch painter, Hendrik Willem Mesdag. Population, about 435,000.

HAGUE PEACE CONFERENCES. Before the first World War most promising movements for world peace were the two conferences which met at The Hague in 1899 and 1907, on the call of the czar of Russia. Twenty-six countries, including the United States, attended the first, and almost twice that number were represented at the second meeting.

The chief objects of the conferences were to secure an agreement for the reduction or limitation of national armaments, and to formulate a plan for settling international disputes by arbitration instead of war. None of the great powers, except the United States and Great Britain, was especially eager to limit their armaments; the German delegation absolutely refused to consider any such scheme. The first object of the conference, therefore, was not attained.

When the conferences considered the problem of international arbitration, Germany declared that it would not approve any plan for compulsory arbitration. The conferences did, however, draft a plan for optional arbitration which led to the establishment of the Permanent Court of Arbitration. This consisted of a list of persons from which arbitrators were to be chosen in case two nations wished to use arbitration as a means to settle a dispute (*see Arbitration*).

Thirteen "conventions" or agreements were also adopted concerning various possible subjects of international disputes, and a series of regulations respecting "the laws and customs of war." These regulations defined the rights of neutral nations in wartime. They also outlawed certain military practises, such as naval bombardment of undefended towns, use of poison gases, and dropping of bombs from balloons and airplanes. Since none of these 13 agreements was ratified by all the powers concerned they were not considered binding, and many of their provisions were disregarded in the World War of 1914-18 and later wars.

HAIG, DOUGLAS HAIG, FIRST EARL (1861-1928). To the courage and ability of a scholarly middle-aged gentleman was largely due Great Britain's success on the western front in the World War of 1914-18. For the soldier on whom the British pinned their faith was Sir Douglas Haig, commander-in-chief of the British forces in France and Belgium.

At the beginning of hostilities Haig was a lieutenant-general, in command of Aldershot, England's great training camp. When the British army threw itself across the channel to stop the first German

avalanche, he commanded the 1st Army Corps. In those black days his courage and optimism were a great help to the men, whose confidence he always held. In December 1916, he was appointed commander-in-chief with the rank of Field Marshal, and this position he held with honor till the end of the war.

Haig was born in Scotland, studied at Oxford, and joined the 7th Hussars in 1885.

He saw his first active service under Kitchener in the Nile expedition, where he distinguished himself and was raised to the rank of major. He served also with distinction in the Boer War, and was made chief of staff to Sir John French, whom he afterwards succeeded as commander of the British army in the World War. At the close of the war he was created Earl and Baron of Bismersyde in the British peerage.

HAIL. The rolling white squall cloud that you sometimes see at the beginning of a thunderstorm is a "hail factory." The air in it is whirling along a line parallel to the earth. If a raindrop is caught and carried up high enough it turns to snow. When it comes down it is coated with water; on rising again, it freezes. The longer it travels the larger it gets; each coat freezes in turn until

the mass of ice is so heavy that it falls to the earth in the form of hail. The more violent the whirl, the larger the hailstone will be before it falls. Some have been seen as large as eggs and there are records of storms in which hail covered the ground to the depth of a foot. Great destruction sometimes attends such storms, animals and even men being killed.

Frozen rain is sometimes called hail when it should properly be termed "sleet." Soft hail which sometimes falls in winter is merely a form of snow. Real hail is always a part of a thunderstorm, and therefore is most likely to occur on hot summer afternoons.

HAIR. The possession of hair is a distinguishing mark of mammals, as the possession of feathers is of birds, though the thickness of the hairy coat varies greatly in different creatures, and is even reduced to a few sparse hairs in such mammals as the hippopotamus and especially the whale. The possession of these warm coats of hair and feathers was one of the factors which enabled mammals and birds to develop so far beyond their common ancestors, the reptiles. Animals which live in cold regions—for instance, the Shetland pony and the polar bear—show a tendency to grow much heavier coats than those which live in a temperate climate. In some mammals, as the hog, the



FIELD MARSHAL EARL HAIG
Leader of the British Armies in the First World War

hair develops into long stiff bristles, in others, as the porcupine and hedgehog, these bristles are greatly enlarged and toughened to form protective spines.

In human beings no hair is found on the palms of the hands and the soles of the feet. The hair of the head is protective; the presence of hair elsewhere is probably only a relic of the heavy hairy coat worn by

the third the negroes, and the fourth the aboriginal Australians and Nubians.

The color of hair is due to a pigment in the cells; this is lacking in white hair. The hair of the straight-haired, woolly-haired, and frizzy-haired peoples is uniformly black; the varying shades of brown, yellow, and red hair are found only among the wavy-haired peoples. Red hair occurs in various individuals, regardless of hair type or race.

Straight hair grows longer than the wavy type; woolly or frizzy hair is shorter. Wavy hair tends to grow longer on women than on men. Wavy hair on a man, if left uncut, may grow somewhat more than a foot long; a woman's hair will usually grow to twice that length, although growths six feet long and more have been known. Among straight-haired and woolly-haired peoples, the sexes have about the same length of hair.

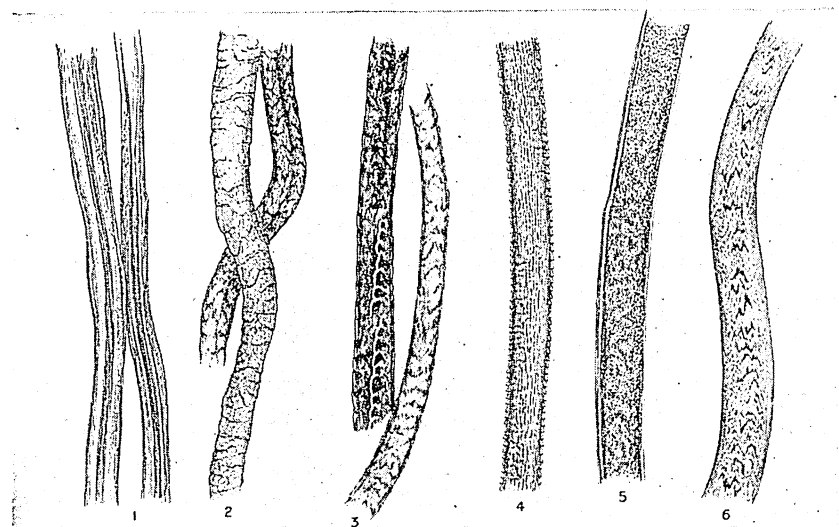
Baldness, or *alopecia*, presents many puzzles, such as the tendency to attack men more often than women. Baldness is most common, however, in wavy-haired people, is much less common

among people with woolly hair, and is rare among straight-haired people. Physicians distinguish two types of baldness. One is ordinary, gradual loss of hair, accompanied by formation of dandruff, or scales of dried oil which has been produced in excessive amounts by the oil glands. This condition is called *seborrhea*. The second type of baldness, called *seborrhea areata*, is marked by loss of hair from round patches; considerable evidence suggests an infection as the cause. Loss of hair may be reduced or even prevented by proper hygienic measures (see Hygiene).

Economic Uses of Hair

The hair of many animals is of economic importance. Some modern uses offer splendid examples both of using by-products and of conserving materials once wasted. Cloth is made from the hair of the sheep, goat, camel, vicuña, and other animals. Felt for hats is made from the hair of rabbits and hares. Cow hair, obtained usually when the animal is killed for food, is used in making mortar and for certain coarse cloths. The hair of horses is made into fishlines and into the tough horsehair cloth used for stiffening garments and for upholstery. Hair from camels, badgers, and other animals is used in artists' brushes. Pig-bristles are made into various kinds of brushes, including toothbrushes. Human hair is used for wigs, hair nets, and other hair goods.

HOW HAIR DIFFERS FROM OTHER FIBERS



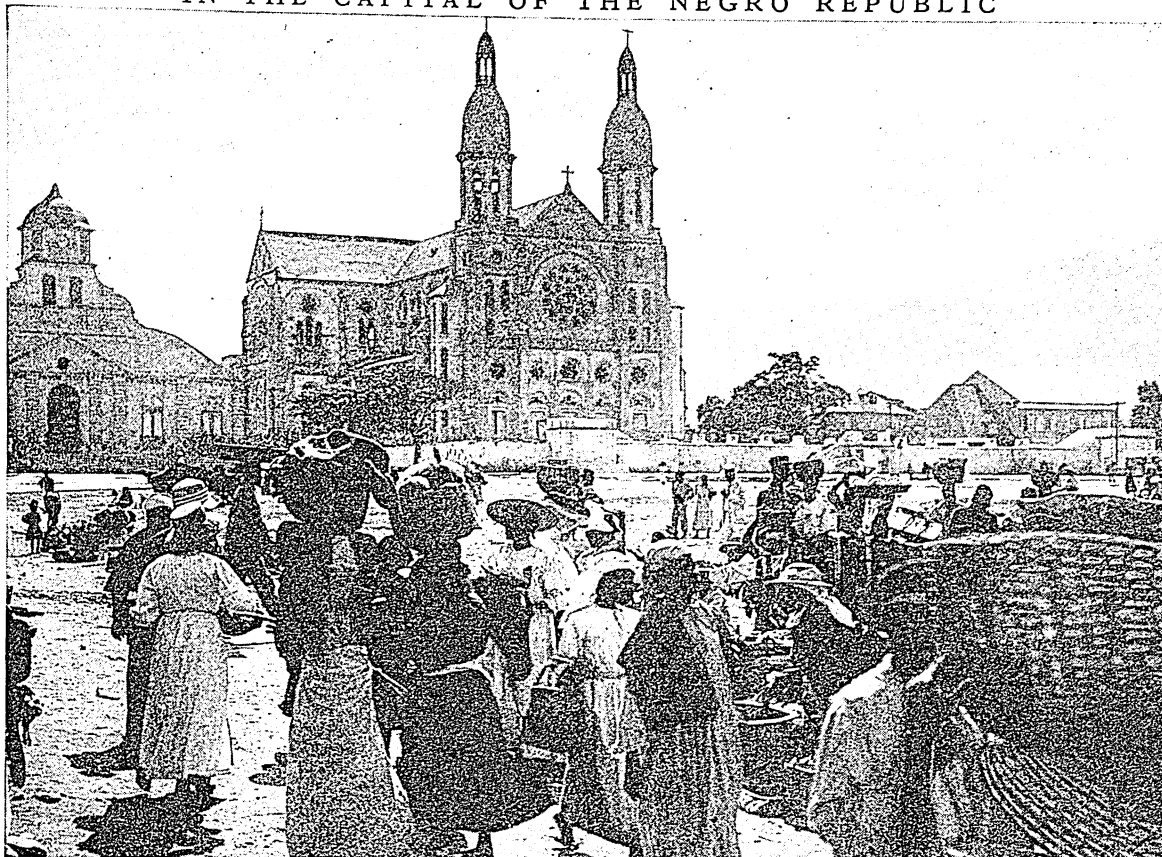
In these enlarged pictures you can see the difference between animal hair and such fibers as silk (1) which can be woven into smooth soft fabrics. Wool (2) is typical of all hair, with a rough scaly surface. Rabbit hair (3) also has large scales. Human hair (4) possesses a fine scale, while camel hair (5) and horse hair (6) have an almost horny surface. It is because of the scales, which interlock and cling together, that many kinds of animal hair can be matted into felt.

our remote prehistoric ancestors. The hair of the human head and beard is constantly being shed and replaced. Most of the lower animals have "shedding periods" when the hair begins to come out and to be replaced with new.

Each hair grows at its root from a tubular "follicle" or sheath in the skin. It is provided with a blood-vessel which feeds it and carries away its waste, glands which provide oil to keep it moist and soft, and nerves which control the blood-vessel and a muscle (the "hair erector") which by contracting makes the hair "bristle" or "stand on end," like the hair on the tail of an angry or frightened cat or the hair in the coat of an angry dog. When cold also an animal will sometimes "ruff up" its coat.

Each hair is a strong, flexible, elastic thread, composed of many horny cells. Some hairs are straight, others wavy, and still others "frizzy" or woolly. Microscopic examination of the cut end of a straight hair shows that it is round, while a curly hair is elliptical in cross-section. Anthropologists have used these differences in texture of human hair as a basis for classifying mankind into the straight-haired, the wavy-haired, and the woolly-haired (sometimes also the frizzy-haired) races, the first including the Chinese and other yellow peoples and the North American Indians, the second the "white" peoples,

IN THE CAPITAL OF THE NEGRO REPUBLIC



It is market day in Port au Prince, capital of Haiti, and the people are crowding around the open air "stores" in front of the Roman Catholic cathedral. Until the American marines took charge in 1915, the city was exceedingly unclean and plague-ridden, but now the people have been taught to a great extent the value of public sanitation.

HAITI (*hā'ti*), REPUBLIC OF. Late in the year 1803 the remnant of a French army which had been crushed by a desperate force of Haitian Negroes sailed silently away from Cap Haitien. The rule of France over Haiti was broken, and at last that beautiful land belonged to the Negroes who had been brought in as slaves by the French to work on its rich plantations. But these people, poor and uneducated, were ill-fitted for self-government. For more than a century revolution followed revolution, until in 1915 the struggling nation—one of the two Negro republics in the world—became a ward of the United States.

This land of vivid beauty and tragic history occupies the western third of Hispaniola, the rugged island that lies between Cuba and Puerto Rico, about 20° north of the Equator. The remainder of Hispaniola is occupied by the Dominican Republic (*see* Santo Domingo). Haiti thrusts up from the sea like a many-towered citadel. Mountains cover two-thirds of its area, which is about that of Vermont. Green and white coral reefs color the sparkling bays.

The mountains, many of them towering more than 7,000 feet, and the trade winds cause the amount of rainfall to vary greatly in different regions. Some regions, notably the central plain, are semi-arid, but

many of the valleys and alluvial plains are so well watered and fertile that Haiti has been called "the black man's paradise." In the rainy season heavy storms on the mountains flood the many short rivers, of which the most important is the Artibonite. The climate is tropical in the lowlands, but in the high mountains the winter temperature sometimes falls below 50 degrees. Haiti has no large animals, but pelicans, flamingos, egrets, and partridge are numerous, and the rivers and bays abound in crabs, oysters, and brilliant-colored tropical fishes.

Except for a relatively small number of mulattoes, who control the government, the native population is pure Negro—descendants of African slaves. Illiteracy and the fatalism that numbs a people after long oppression have kept them in an almost primitive state. While revolutions tore the country, they raised scarcely more than was needed for their own use and there was little trade. Even today, though agriculture is encouraged and roads are being built to promote trade between towns, the peasants remain small farmers.

Since little effort has been made to irrigate the drier regions, the peasants are crowded into the valleys and alluvial plains, in some places with more than 300 persons to the square mile. Many own their tiny

plots of land, others rent from the state. Their homes are squat mud huts with palm-thatched roofs. With machetes and axes, they cultivate their little food crops of sugar cane, corn, beans, and manioc root for cassava flour. Abundant fruit trees—including the banana, coconut, orange, avocado, mango, and breadfruit—thrive with little care in the fertile soil.

Despite their poverty, the Haitians are a picturesque people, fond of bright color and music and dancing. The chief religion is the Roman Catholic, but many peasants, particularly in the uplands, still practise African voodooism. Although Haiti's official language is French, the peasants speak a Creole patois. Education is free through all the grades.

For many years, Haiti exported only logwood and coffee, which grows wild on the mountain slopes. With the establishment of law and order, however, sugar, cotton, and sisal plantations have been encouraged. These products, with pineapples and bananas, are now valuable exports. Coffee, however, is still far in the lead, with France as the chief customer. Mineral development has been negligible, although small deposits of iron and copper have been found, with traces of gold, silver, lead, and zinc. Some salt is exported. Haiti's once thick forests of logwood, cedar, and other valuable timber are largely depleted.

The chief cities are Port au Prince, the capital, and Aux Cayes and Cap Haïtien. Port au Prince, built on the fertile alluvial plain known as the Cul de Sac, faces one of the most beautiful bays in the world—an arm of the great Gulf of Gonaïves, which deeply indents Haiti on the west. Aux Cayes lies on the southern coast, and Cap Haïtien on the northern coast.

Haiti's Bitter History

The island has had a turbulent history ever since its discovery by Columbus in 1492. It was then inhabited by Arawak Indians, who called it Quisqueya; Haiti was their word for "mountainous." Columbus named the island "La Isla Española," which later became latinized to Hispaniola, "Little Spain." He established a Spanish settlement, La Navidad (The Nativity), near the present town of Cap Haïtien, and Haiti thus became the first

part of the New World to be colonized by Europeans. Forced by the Spaniards to oppressive labor, the Indian population soon perished (*see* Las Casas, Bartolomé de). To repopulate the island, the Spaniards in 1510 began importing African slaves. In 1697 Spain was forced to cede (Treaty of Ryswick) the western, or Haitian, part of the island to the French, who developed vast sugar plantations and made Haiti their richest colony.

After many futile insurrections, the Negroes united in 1798 under Toussaint L'Ouverture, a freed slave. Toussaint, captured by trickery, died in a French prison; but his successor, Jean Jacques Dessalines, "The Tiger," drove out the French late in 1803. In 1804 Dessalines proclaimed the colony's independence and massacred almost all the remaining white inhabitants. The great plantations, sugar mills, irrigation works, and roads fell into ruins. In 1806 Dessalines was assassinated. His general-in-chief, Henri Christophe, succeeded him. Declaring himself emperor, Christophe attempted to reconstruct the ravaged country. His ornate palace of Sans Souci near Cap Haïtien and his vast citadel, though now in ruins, are marvels of massive masonry. After Christophe's suicide, a succession of military despots seized power.

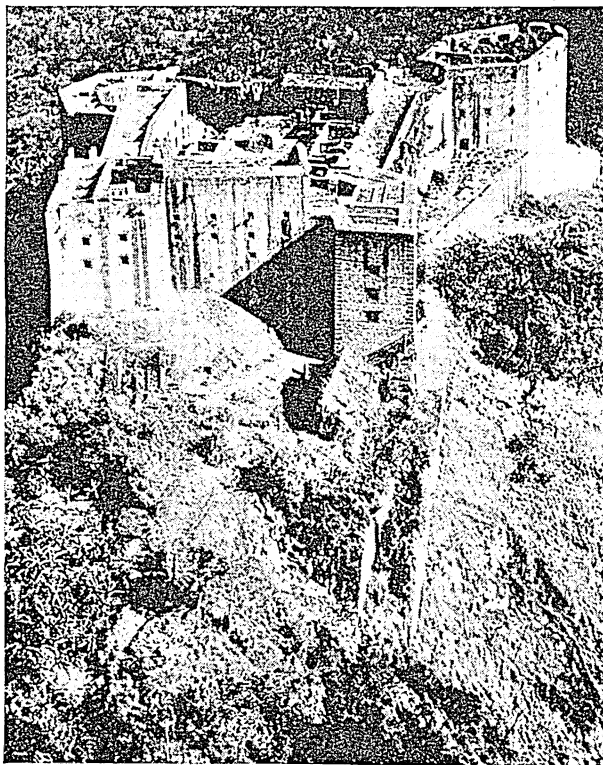
American Intervention

By 1915 revolutions and banditry had reduced Haiti to a miserable condition, and it was in debt to European interests. The United States, under its Monroe Doctrine, felt obliged to intervene and administer the finances under a treaty with Haiti.

Under American control much was done to clean up Haiti, stamp out disease, and place the country on a sounder trade basis. Roads, bridges, public buildings, and hospitals were built. The city streets were paved, and sanitary laws enforced. Lighthouses were improved, and a coast guard and well-trained police force were organized. Rural clinics brought medical care to the disease-ridden peasants. To carry on the work, Haitians were trained as doctors, nurses, and executives.

Despite improved conditions, the people of Haiti resented American occupation and clamored for independence. In 1930 the parliamentary elections—the first held in 12 years—brought in a solidly anti-American senate and chamber of deputies. The occupation force was withdrawn in 1934. In 1937 a border dispute with the Dominican Republic cost many Haitian lives. Area of Haiti, 10,200 square miles; population, about 3,000,000.

RUINS OF THE MASSIVE CITADEL OF CHRISTOPHE



On the almost inaccessible summit of a mountain, Bishop's Bonnet, Henri Christophe built his huge fortress as a gesture of defiance to the French. It had barracks for 10,000 troops. All the building material and heavy cannon were hauled to the top by hand.

HALE, EDWARD EVERETT (1822-1909). "If all the little children who have sat on Dr. Hale's knee were started in a procession four abreast from the State House steps, there would be a line of merry faces across the Common, out to the Public Library, over Harvard Bridge, and away beyond to the remoter landmarks." These words, better than a record of all he did as preacher, social worker, and writer, help us to understand why Edward Everett Hale for two generations was not only esteemed but loved by the people of his native Boston as well as by all Americans who knew him or his work.

His was a distinguished ancestry. Nathan Hale, the "Martyr Spy," was his grand-uncle, and the distinguished orator, Edward Everett, was his uncle. After graduating from Harvard, he studied theology, entered the Unitarian ministry, and became pastor of the Church of the Unity in Worcester, Mass., and later of the South Congregational Society, a Unitarian church in Boston. He was a leader in religious affairs, and in social and benevolent movements of many kinds.

To the country in general, Dr. Hale is best known as the author of that "parable of patriotism," as it has been called, "The Man Without a Country." This short story is one of the most popular that American literature has produced. It tells of a young army officer, Philip Nolan, who, in a moment of passion during his trial for treason with Aaron Burr, cried, "Damn the United States. I wish I may never hear of the United States again."

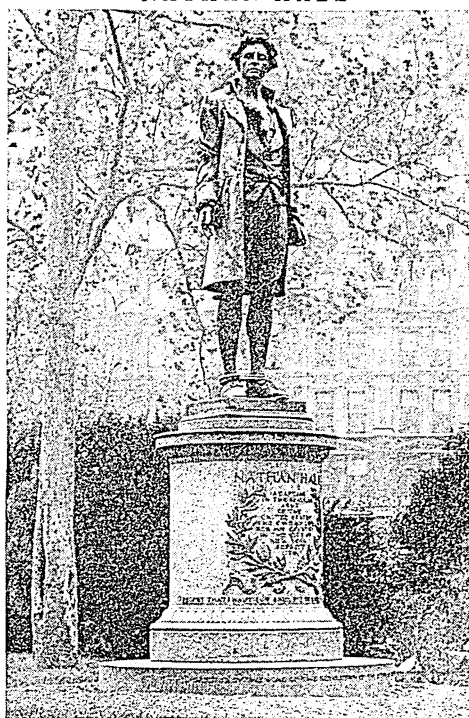
He was sentenced to the fulfilment of this unfortunate wish, and for 55 years was kept on board ships at sea, and never permitted ashore in the United States. During all that time he never saw his country, and never heard of it until the day of his death.

So real did this story seem that many thought it was a record of actual fact, until the author himself stated that it was his own invention. The seeming truth of the tale is evidence of the author's skill. At the time of the Civil War, when it was written, the short story was in a period of rapid development. Dr. Hale, by his attainment of plausibility and reality, helped mold this type of fiction into its modern form. The tale has been the means of instilling a deeper love of country into the hearts of countless Americans. Like the memorable 'Uncle Tom's Cabin', it was effective in intensifying Union loyalty. Dr. Hale also

edited religious and other journals, and wrote or edited more than 60 books with a wide range of subjects—fiction, travel, biography, history, and sermons.

Among his best-known works are: 'My Double and How He Undid Me' (1859); 'The Man Without a Country' (1863); 'Ten Times One Is Ten' (1870); 'In His Name' (1873); 'Philip Nolan's Friends' (1876); 'A New England Boyhood' (1893); 'Lowell and His Friends' (1899).

NATHAN HALE



This statue of the young Revolutionary captain, by Frederick MacMonnies, was erected by the Sons of the Revolution of New York State in City Hall Park, New York City.

HALE, NATHAN (1755-1776). In the dark days of 1776, after the retreat of the American army from Long Island, General Washington called for a volunteer to enter the British lines to obtain information concerning the enemy. Nathan Hale answered the call. He had been born June 5, 1755, in Coventry, Conn., had graduated from Yale in 1773, and was teaching school when war broke out. An ardent patriot, he deserted his scholarly profession in July 1775 to enlist in the colonial army. He served first as a lieutenant, but his initiative and bravery soon earned him the rank of captain.

Nathan Hale had an exceptionally fine mind, he was a good athlete, and he was very popular. Some of his fellow officers, realizing that a splendid future lay before him, tried to dissuade him from undertaking his hazardous mission. But, with characteristic simplicity, he said: "I think I owe to my country the accomplish-

ment of an object so important and so much desired by the commander of her armies—yet I am not influenced by the expectation of promotion or pecuniary reward. I wish to be useful, and every kind of service necessary for the public good becomes honorable by being necessary."

In the disguise of a Dutch schoolmaster he entered the British lines. He procured sketches and other information, and was on his way back to the American camp when he was detected and arrested, on Sept. 21, 1776. The papers in his shoes, as well as his own testimony, convicted him, and in accordance with military law General Howe ordered him to be hanged as a spy. His farewell letters were destroyed before his eyes, and he was denied a Bible and a minister. On the morning of September 22 the sentence was carried out. His last words are said to have been, "I regret that I have but one life to lose for my country."

The most famous statue of Nathan Hale stands in City Hall Park, New York City. Several monuments have been erected to his memory in Connecticut, his native state. His services were officially recognized

by the United States government in 1926, one hundred and fifty years after his death, when a half-cent postage stamp was issued in his honor.

HALIBUT. One of the commonest fish on the menu is the halibut. Yet it is probable that many persons who eat a halibut steak have no idea of the great size of the fish, for a whole halibut is seldom displayed in the market. Halibut caught for market are commonly from 3 to 5 feet long and weigh from 30 to 100 pounds. Some weigh 200 or 300 pounds, and specimens more than 9 feet long and weighing more than 600 pounds have been caught. The female is larger than the male, which rarely weighs more than 60 pounds.

The halibut is the giant of the flatfish family (see Flatfish). It differs slightly in shape from its relatives the flounder, the sole, and the turbot in having a thicker and more elongated body. It lives 100 to 350 fathoms deep in cold waters of the Pacific and the Atlantic. In the Pacific it ranges as far south as San Francisco. In the Atlantic it is found as far south as New York and Havre, France.

A large, mature female may lay from 1,000,000 to 3,500,000 eggs about one-eighth of an inch in diameter. The larva swims upright and has an eye on each side of the head. But soon the young fish starts to swim on its left side, and the left eye begins to migrate to the right side of the head, where both eyes remain, leaving the left side blind. The whole right side of the adult is brown, while the left side is pale, almost colorless. The halibut sometimes buries itself in the sand to hide from its enemies, the shark and the seal, or to lie in wait for prey. It feeds heavily on mollusks and crustaceans, crunching them with strong teeth set in powerful jaws. It also eats skate, cod, menhaden, and mackerel. With a flip of its tail, it can stun a large codfish, which it then devours at leisure.

The halibut is the most important of the flatfish as a food supply, and from its liver is extracted "haliver oil," which is rich in vitamins A and D. The

fish is caught by the same methods as the cod. The world's most important halibut fishery extends 2,000 miles along the Pacific coast of North America from Oregon to the Bering Sea. Large quantities of halibut are caught in Japanese waters and in the Atlantic off the coast of the United States and Newfoundland. The catch in the waters near Iceland, Greenland, and Norway is also of commercial importance.

Scientific name of the common halibut, *Hippoglossus hippoglossus*; of the arrow-toothed halibut, *Atheresthes stomias*; of the Greenland halibut, *Rheinhardtius hippoglossoides*. The arrow-toothed halibut ranges in the Pacific from San Francisco to Alaska; the Greenland halibut, from the Arctic parts of the Atlantic south to Finland and Grand Banks.

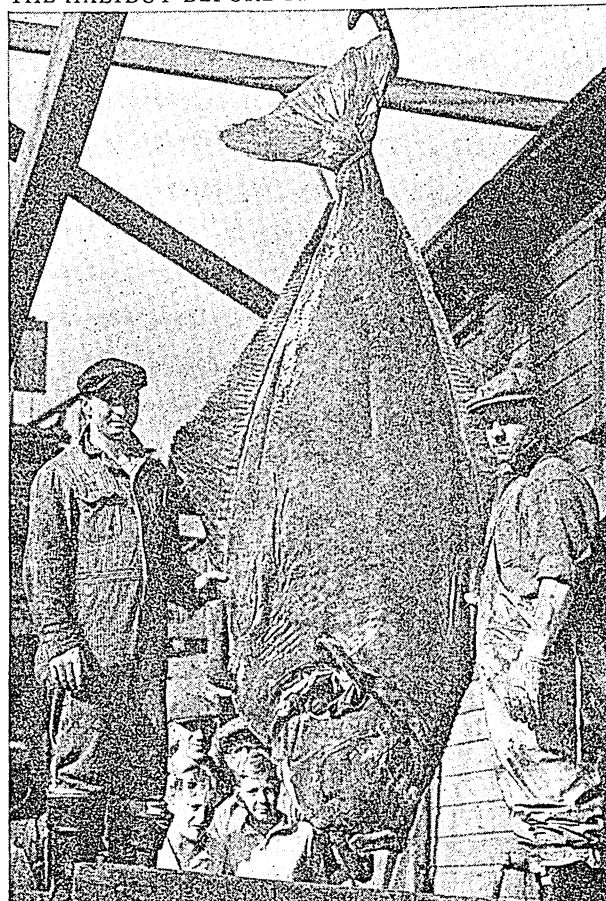
HALIFAX, NOVA SCOTIA. The poet Kipling gave the name "The Warden of the North" to Halifax, capital of Nova Scotia, because it is the most strongly fortified position and the chief naval station of the British Empire in North America. It has occupied this position almost from the date of its founding in 1749. When the British troops were driven out of Boston in 1776, they sailed away to Halifax to reorganize for the struggle. In the War of 1812 it was the base for the operations of British privateers, and during the American

Civil War it became an important base for the Confederate blockade-runners. Many troops of both the United States and Canada sailed from Halifax during the World War of 1914-1918. In the second World War, it served as one of the chief bases for sending supplies from Canada to England. To protect the huge convoys from attack by enemy submarines, a net of steel was installed in the harbor.

One reason why Halifax is so important is that it is 600 miles, or about one day's steaming, nearer Liverpool than New York is. It is also nearer to some ports of South America and to South Africa than several other northern ports of North America.

Its favorable position and its magnificent harbor, open the year around, make Halifax a great commercial center. To improve the shipping facilities, the

THE HALIBUT BEFORE IT IS CUT UP FOR MARKET



This 325-pound halibut was landed at Seattle, Wash., by the halibut schooner *Yakutat*. Halibut are usually caught in dredge nets dragged along the sea bottom from the stern of the vessel.

Canadian government has spent \$30,000,000, and has built huge terminals where transcontinental trains can run alongside the great Atlantic liners.

Manufactures of importance have also grown up. Raw sugar brought in from the West Indies is refined in the largest refinery in Canada. There is a large oil refinery, and foundries and machine shops make and repair equipment used by the great transportation companies. Population, 59,275.

HALL, CHARLES MARTIN (1863-1914). On the morning of Feb. 23, 1886, a young man of 22 stood anxiously over a complicated mass of electric wires, crucibles, and heating apparatus in a woodshed in Oberlin, Ohio. For two hours Charles Martin Hall watched, as the contents of one of the crucibles grew hotter and hotter. Finally, he turned off the powerful current, and, shaking with excitement, poured out the molten mass. A number of little silver-colored drops had separated, and they quickly hardened into shining buttons of metal. Catching up the globules, Hall ran to the near-by campus of Oberlin College. Bursting into the office of his friend and adviser, Prof. F. F. Jewett, he cried, "Professor, I've got it!"

This incident was the foundation of one of our greatest modern industries, for Hall had discovered a cheap process of separating aluminum from its oxide. Pure aluminum oxide was abundant and cheap, but to melt it by electrolysis required a temperature of 2050° C. Hall's problem was to find a substance which melts at a lower temperature and which, when melted, dissolves aluminum oxide. He found his solvent in cryolite (see Aluminum).

Charles Martin Hall was born at Thompson, Ohio, Dec. 6, 1863. His father was a Congregational minister, who later took his family to Oberlin to live. Charles' absorbing interest in chemistry be-



Charles Martin Hall

gan when he found an old book on the subject in his father's library. Even before he entered college, young Hall was interested in the extraction of aluminum, and set himself to find a process which would be commercially profitable. At college he conducted experiments to this end, and eight months after graduation he made his epochal discovery.

The date is important, for in April of the same year, a young Frenchman, Paul Louis Toustaint Héroult, was granted a French patent for the same process. Hall filed application in the United States Patent Office, in July 1886, for a patent on his discovery, but it was not granted until 1889.

Meanwhile Hall had all the difficulties usually encountered by inventors. Manufacturers at first were not interested. When at length the Mellon interests gave him financial backing and successful manufacture was under way, another manufacturer brought a lawsuit accusing Hall of having stolen the Héroult process. But he was cleared of the charge in 1893 and eventually made a large fortune from his invention.

The success of the Hall-Héroult process has made the cost of a pound of aluminum a matter of cents instead of dollars, so that we have kitchen pots and pans and hundreds of other common articles made of this abundant metal.

HALL OF FAME. On University Heights in New York City, overlooking the Hudson and Harlem river valleys, stands the "Hall of Fame for Great Americans." It is a granite colonnade 630 feet long which follows the curve of the terrace on which rest several of the buildings of New York University. In the colonnade are panels for 150 bronze tablets, each to bear the name of the person commemorated, the dates of his birth and death, and an appropriate inscription. According to the conditions established in 1900 by Helen Gould, who gave the memo-

NAMES IN THE HALL OF FAME

CHOSEN IN 1900

George Washington	Henry Clay
Abraham Lincoln	Nathaniel Hawthorne
Daniel Webster	George Peabody
Benjamin Franklin	Robert E. Lee
Ulysses S. Grant	Peter Cooper
John Marshall	Eli Whitney
Thomas Jefferson	John James Audubon
Ralph Waldo Emerson	Horace Mann
Henry Wadsworth Longfellow	Henry Ward Beecher
Robert Fulton	James Kent
Washington Irving	Joseph Story
Jonathan Edwards	John Adams
Samuel F. B. Morse	William Ellery Channing
David Glasgow Farragut	Gilbert Stuart
	Asa Gray

NAMES SUBSEQUENTLY ADDED

James Russell Lowell	Mark Hopkins
John Greenleaf Whittier	Francis Parkman
John Quincy Adams	Elias Howe
James Madison	Joseph Henry
Alexander Hamilton	Charlotte Cushman
William T. Sherman	Rufus Choate
Louis Agassiz	Daniel Boone
Maria Mitchell	Samuel L. Clemens
Emma Willard	Augustus Saint-Gaudens
Mary Lyon	James Buchanan Eads
Harriet Beecher Stowe	Patrick Henry
Oliver Wendell Holmes	William T. G. Morton
Edgar Allan Poe	Roger Williams
James Fenimore Cooper	Alice Freeman Palmer
Phillips Brooks	Edwin Booth
William Cullen Bryant	John Paul Jones
Frances E. Willard	Walt Whitman
Andrew Jackson	James Monroe
George Bancroft	James McNeill Whistler
John Lothrop Motley	Simon Newcomb
Matthew Fontaine Maury	William Penn
Grover Cleveland	Stephen Foster

rial to the American people, only persons who had been dead 10 years or more were eligible to be so honored. In 1922 it was decided to extend to 25 years the minimum time that must elapse after death.

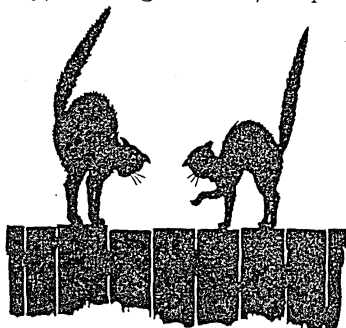
Fifty names were to be inscribed in 1900 and five names were to be added every fifth year thereafter until the full number is completed. Only 29, however, were elected in 1900 from more than 1,000 nominations. These 29 names and those subsequently chosen are given in the list on page 201.

Nominations made by the general public are received by the senate of New York University and those seconded by the senate are submitted to a committee of 100 citizens, who vote upon them. All elections are subject to the final approval of the university senate. If the full number is not chosen, the vacancies may be filled at the following election. Fifteen classes of citizens are recommended for consideration, including statesmen, authors, artists, scientists, educators, physicians, businessmen, inventors, explorers, philanthropists, and others. Foreign-born Americans have been eligible since 1914. In 1904 a site in the colonnade was set apart as a Hall of Fame for Women, but in 1922, after seven names had been chosen, it was decided to include the names of the women with those of the men.

HALLOWE'EN. Customs and superstitions gathered through the ages go into our celebration of Hallowe'en, or "Holy Eve," on October 31. The day is so named because it is the eve of the festival of All Saints, but many of the beliefs and observances connected with it arose long before the Christian era, in the autumn festivals of pagan peoples.

The ancient Druids had a three-day celebration at the beginning of November. On the eve before, they believed, spirits of the dead roamed abroad, and they lighted bonfires to drive them away. In ancient Rome the festival of Pomona, goddess of fruits and gardens, occurred at about this time of year. It was an occasion of rejoicing associated with the harvest; and nuts and apples, as symbols of the winter store of fruit, were roasted before huge bonfires.

Even after November 1 became a Christian feast day, honoring all saints, the peasants clung to the old



pagan beliefs and customs that had grown up about Hallowe'en. It became a night of mystery and fun-making, with many picturesque superstitions. Folk came to believe that they could foretell the future on that night by per-

forming such rites as jumping over lighted candles. In the British Isles great bonfires blazed and laughing bands of "guisers," young people disguised in grotesque masks and carrying lanterns carved from turnips, gathered in each village. Their rollicking fun and cherished superstitions are described in Robert Burns's famous poem 'Hallowe'en'.

Our Hallowe'en celebrations today keep many of these early customs unchanged. Young and old still gather to hunt nuts and to duck for apples bobbing in a tub of water. Grin-

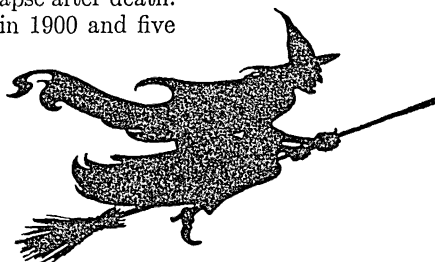
ning pumpkin jack-o'-lanterns, rustling cornstalks, and white-sheeted figures create an air of mystery, and black paper witches and cats are used for party decorations.

Hallowe'en is a favorite "special day" for school celebrations, when young people hold costume parties, play old-fashioned games, and give clever plays and pageants based on the ancient customs. Frequently whole communities gather for a Hallowe'en festival, as did the villagers of earlier days.

Books About Hallowe'en

Among good Hallowe'en stories for younger children are "Andrew Coffey," in 'Celtic Fairy Tales', and "The Hobyahs," in 'English Fairy Tales', both by Joseph Jacobs (Putnam); "The Goblins Who Stole a Sexton," by Charles Dickens; and "The Hungry Old Witch," in 'Tales from Silver Lands', by Charles Finger (Double-day). For older children and adults, "Tomson's Hallowe'en," by Margaret Baker (Duffield); "The Devil and Tom Walker," by Washington Irving; and "The Sack of Emeralds," by Lord Dunsany. Books giving helpful suggestions for putting on entertainments or plays are 'Little Plays for Little People' ("Hallowe'en"), by Anne P. Sanford and Robert H. Schauffler (Dodd); 'Suppose We Do Something Else' ("Hallowe'en"), by Imogen Clark (Crowell); 'Book of Hallowe'en', by Ruth E. Kelley (Lothrop); and 'Holiday Plays for Home, School, and Settlement' ("On All Soul's Eve"), by Virginia Olcott (Dodd).

HALS (*hals*), **FRANS** (1580?-1666). This Dutch painter, who is now recognized as one of the greatest portrait painters of all time, was almost forgotten and his work was ignored for two centuries after his death. So little was he esteemed that some of his paintings were sold for a few dollars, though lately a single work has brought as much as \$350,000. Critics today put him next to Rembrandt at the head of the Dutch school, and some even call him the greatest of all painters for truth of character.



Frans Hals had a checkered life, marked by the same bold contrasts of light and shade that are found in his work. Though of an ancient patrician family, the equal of the sturdy Haarlem burghers whose portraits he painted so profusely, Hals found the rollicking life of tavern and street more to his taste. Singers and jesters, pot-girls and tavern heroes—these were his favorite subjects; and he set them down on canvas with such an unquenchable humor and joy of living and so masterly a hand that no one can look at them without a responsive smile. But the painter's love of tavern life reduced him to penury, and near the close of his long life we find him so poor that he had to apply to the municipality for alms.

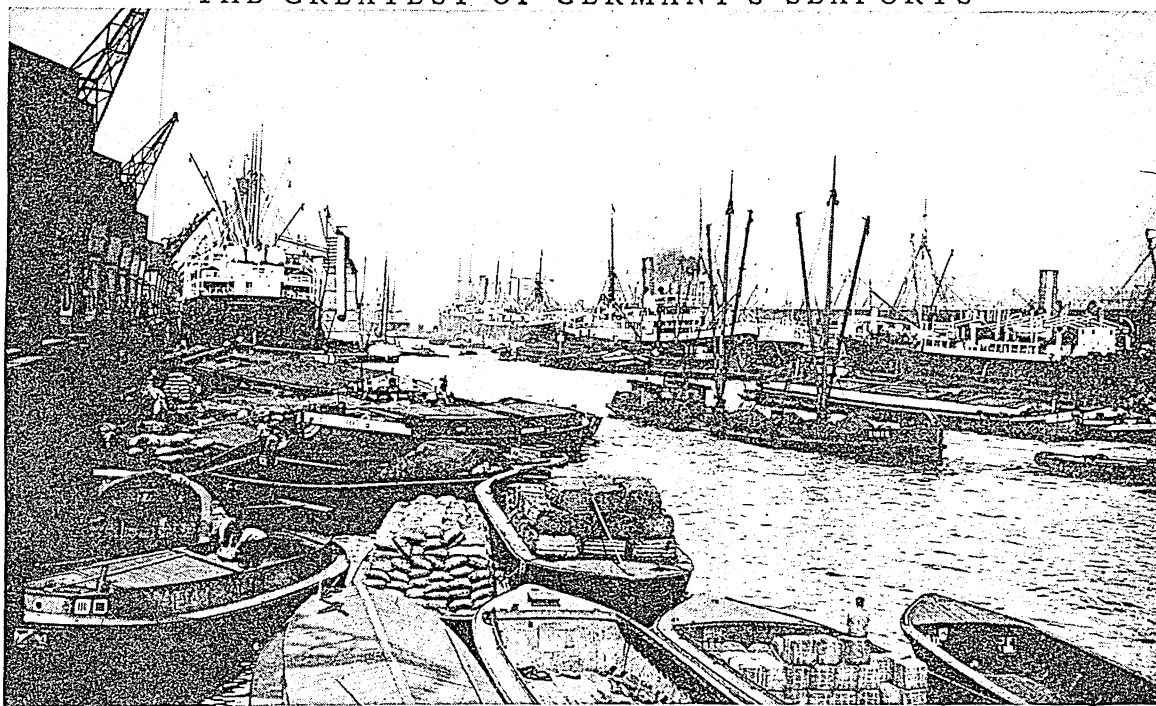
Born in Antwerp, Hals moved to Haarlem in Holland when he was a young man. In 1616 he began the first of the great series of shooting-guild groups and public officials that show his genius particularly well. In the Town Hall of Haarlem 84 ladies and gentlemen look down from the walls in eight great canvases. The last of the series was painted in 1661, when Hals was 81. There on the walls may be traced the artist's development. The picture painted in

painter's declining years? Some hold to this explanation; others say that bright colors were so expensive that he had to use the cheaper black and white after his days of plenty were over.

Many other examples of Hals's work are scattered throughout the world in public and private galleries. 'The Fool', a copy of which hangs in the Rijks Museum in Amsterdam, is considered by many to be the best character portrait ever painted. 'Hille Bobbe', an old woman with a half-witted grin, may be seen in the Royal Museum in Berlin. His best-known work is 'The Laughing Cavalier' in the Wallace Collection in London. The original owner paid \$400 for it. Sir Richard Wallace paid \$10,200 for it in 1865, and since then its value has increased greatly. **HAMBURG, GERMANY.** Though it is Germany's greatest seaport, Hamburg lies 75 miles inland on the Elbe River. Constant dredging keeps the river deep enough to admit the largest liners, and the splendid harbor was formed by damming the Alster River, a tiny tributary of the Elbe.

The city presents a singular combination of land and water life, for the picturesque, if dirty, older

THE GREATEST OF GERMANY'S SEAPORTS



Flags from all over the world are always flying in the great harbor of Hamburg, for this is not only the largest German seaport, but in some years handles almost as much commerce as New York or Hongkong. Although Hamburg is 75 miles from the sea, the largest vessels can come to dock here. The waterfront is nearly ten miles long, and is equipped with all the conveniences for loading, unloading, and repairing vessels. Hamburg also has some of the world's largest shipbuilding yards.

1633 shows him at his most vigorous period, when his brilliant color and quick grasp of fleeting expression were at their height. The later groups are painted with great skill but the coloring has been toned down to somber gray tints. Does the grayness of these last pictures reflect the sadness of the poverty-stricken

part of the town to the east is intersected by a great number of narrow canals, lined with warehouses and squat dwellings that seem to rise right out of the water. Barges and skiffs loaded with merchandise ply up and down these canals, and people may go and come from home to business in pleasant little

steamers. Great sea-going vessels can come at high tide to the heart of the city and unload their cargoes into barges that distribute them as far inland as Prague. (*See Elbe River.*)

Hamburg has been for centuries a city-state. Its republican constitution of 1921 was set aside in 1935 and its administrators, like those of other German cities, were made answerable to the central government. In 1937, its outlying port of Cuxhaven at the mouth of the Elbe was given to Prussia, but in return, Hamburg received two cities next to it—Altona and Harburg-Wilhelmsburg. Before these changes, the area of the city-state was about 160 square miles.

With docks and quays along the river front for many miles, crowded with shipping in normal times, and with its densely packed houses in the background surmounted by lofty church spires, the city gives an impression of massive grandeur. On the borders of the Binnen Alster, the smaller of the two lakes, are grouped fashionable avenues and the more important business streets, lined with magnificent buildings.

In the Hopfenmarkt, one of the largest public squares, stands the church of St. Nicholas (Nikolai-kirche). Built as a memorial of the fire of 1842, it is the third highest religious edifice in the world, its spire soaring 483 feet above the street level. The new Rathaus is the most important of the secular buildings. The hospital at Eppendorf is one of the finest in Europe. Hagenbeck's private zoölogical gardens, which formerly contained the largest and most complete collection of wild animals in captivity, are also noted for life-size models of prehistoric monsters. The site of the city's old ramparts and fortifications has been converted into gardens and promenades of extraordinary beauty.

The History of Hamburg

Hamburg has its origin in a fortress and bishopric founded here by Charlemagne in 808-811. Its importance as a center of commerce began in the 12th century when Emperor Frederick I granted it free navigation of the Elbe, with the right of levying toll on foreign shipping. In 1241, it joined in the formation of the Hanseatic League and became the seat of its upper court (*see Hanseatic League*). This gave a tremendous impetus to its rapidly increasing wealth and commercial importance. In 1510 Maximilian I reorganized Hamburg as a free imperial city. Through its vigorous administration Hamburg suffered little from the Thirty Years' War, so fatal to other parts of Germany. Under Napoleon the French occupied it from 1806 to 1814.

Hamburg's modern greatness came in the middle of the 19th century with the development of great steamer lines to all parts of the world. Lying on the most south-easterly inlet of the North Sea, with an ice-free harbor the year round and with waterways to carry goods cheaply to the interior, it soon became the chief seaport of continental Europe. Its manufactures include shipbuilding, sugar refining, chemicals, furniture, and flour.

The wide streets and handsome modern structures date from after the great fire that destroyed one-third of the city in 1842. During the second World War, the city was again frightfully damaged by frequent British bombing raids which rained explosives on shipyards, docks, and industrial plants. Population, including Altona and Harburg-Wilhelmsburg, about 1,685,000. **HAMILTON, ALEXANDER** (1757-1804). Of all the men who aided in founding the republic of the United States, and in framing and setting up the government under the Constitution, the most brilliant was Alexander Hamilton. In spite of his youth (he was not yet 20 when the war began) he was one of Washington's most trusted aids in the Revolution; as a lawyer he ranked among the foremost of his time; in the critical period of 1783-89 he won recognition as one of the soundest political thinkers of the day; and in setting up the new Federal government he had the chief part in translating the lifeless provisions of the Constitution into a strong, national governing system. It is not too much to call him the greatest constructive statesman in United States history.

Hamilton's history was as unusual as the man himself. Born in the island of Nevis, in the British West Indies, he inherited from his well-born Scotch father shrewdness and a logical mind, while from his gentle Huguenot mother he received the liveliness and charm characteristic of the French. He early displayed a talent for writing, and his vivid description of a West Indian hurricane, which appeared in one of the local papers, so impressed his friends that they raised money and sent him to America to complete his education.

Hamilton's course at King's College (now Columbia University) in New York City was interrupted by the outbreak of the Revolutionary War. As early as 1774 he had begun to advocate the cause of the colonists; and as soon as the conflict began he entered the army, and was soon made captain. Then for four years (1777-81) he was on Washington's staff with the rank of lieutenant-colonel. He took a brilliant part in the field in the campaign which ended with Cornwallis' surrender. Washington felt for him the sincerest admiration and affection.

Even during the war Hamilton had seen the need for a strong central government; and during the critical period which followed, when the country was "floundering helplessly in a sea of unpaid debts and broken promises," he advocated the formation of a new constitution to take the place of the weak Articles of Confederation. He persuaded New York to send delegates to the Philadelphia Convention, and was himself chosen as one of the three to represent the state; but the other two were bitter Antifederalists and he was constantly outvoted until they withdrew from the convention. Then Hamilton signed the Constitution for New York. He believed that a limited monarchy like that of Great Britain was the best on earth, and failing that, he would have preferred a strong aristocratic republic, with the officers

chosen for life. Nevertheless he exerted all his great powers in support of the Constitution that was formed. The opposition in his own state under Gov. George Clinton was very strong and without New York's ratification the Constitution could win no real success. So Hamilton, with the assistance of Madison and Jay, undertook to write a series of newspaper articles in its defense over the signature "The Federalist." Not only did these articles prove the decisive factor in securing New York's ratification, but they had a tremendous influence throughout the country. Although written only to serve a particular purpose in his own day, they have proved of great permanent value to students of law and political science, and are regarded as a classic commentary on the Constitution.

Washington appointed Hamilton as the first Secretary of the Treasury, and it was in this office that he left his strongest impress on the American government. It was he who at the outset gave the government under the Constitution its leaning toward strength and national unity on which Chief Justice Marshall was later able so effectively to build. His financial measures not merely assured the payment in full of the foreign and domestic debt of the United States, but also included the taking over by the United States of the debts contracted by the states as a result of the Revolution. The provision he carried through Congress only by a bargain which gave to the South the location of the Federal Capital on the Potomac. But the effect of the measure was not merely to restore the credit of the country, but to bind to the Union every holder of state and national "script" or bonds. Other important measures included the establishing of a national bank and the enacting of a tariff which should "protect infant industries." No American statesman ever had greater tasks to face than had Hamilton, and none was more successful in meeting them.

In his efforts to strengthen the national government Hamilton was opposed by Jefferson, Washington's Secretary of State, who was a firm believer in state's rights, and opposing views as to struggling France and England widened the breach. The two became the leaders of the first organized political parties of the United States—the Federalists and the Democratic Republicans (*see* Political Parties). Jefferson resigned from office at the close of 1793, and Hamilton a year later, but their party antagonism continued. In the election of 1800 Jefferson's party swept the country, but owing to a tangle of the election laws Congress was called upon to decide whether

Jefferson or Aaron Burr should be president. Hamilton used his influence to defeat a plan of less scrupulous Federalists to substitute the vice-presidential for the presidential candidate of their opponents.

Hamilton knew that the voters meant Jefferson to be their chief executive, and besides he profoundly distrusted Burr.

As a result of Hamilton's persistent opposition to him Burr finally challenged Hamilton to a duel. According to the accepted code of honor in his day, Hamilton could not refuse the challenge. On the morning of July 11, 1804, they met at Weehawken, a noted duelling-ground on the Jersey shore of the Hudson, opposite New York City. Hamilton did not intend to fire, but his opponent aimed with deadly precision. Hamilton fell mortally wounded, and died the next day. He was generally mourned by his countrymen; even those who differed from him politically were compelled to respect his great abilities and patriotism, and his untimely death was looked

ALEXANDER HAMILTON



"The Greatest Constructive Statesman in United States history."

upon as a great public calamity.

HAMILTON, ONTARIO. Its location on an excellent harbor at the western end of Lake Ontario, and the cheap electrical power obtained from Niagara Falls, and the smaller Decew Falls, have combined to make Hamilton one of the foremost manufacturing cities of Canada. It has hundreds of factories, which produce steel, iron, cotton and woolen goods, farm machinery, electrical supplies, stoves, furniture, and many other articles. Among the chief establishments are the Canadian plants of the International Harvester, Westinghouse, International Steel, and Oliver Plow companies. Hamilton is also the shipping center for the rich Ontario fruit district. Natural gas is obtained from the nearby Welland fields.

Hamilton is an attractive city, with its broad tree-bordered streets lined with residences and fine public buildings, which extend from the bay up the slope of "the Mountain," a continuation of the ridge over which the Niagara River flows to make Niagara Falls. Population, 155,547.

'HAMLET'. By almost universal consent this is regarded as Shakespeare's greatest tragedy. The opening of the play reveals Hamlet, the young prince of Denmark, plunged in bitter grief by the sudden taking off of his royal father, who according to report had died of a serpent's sting. The fact that the queen, his mother, has almost immediately married the dead king's ill-favored brother adds to the Prince's sorrow. To him appears from the tomb the dread spirit of his father, revealing that, "sleeping, by a brother's hand" he had been put to death; and calls

upon Hamlet to revenge this "foul and most unnatural murder."

Hamlet's brilliant, sensitive mind is thrown into feverish activity by the horror of this deed, yet he would make sure of his uncle's guilt. He feigns insanity, the better to watch the guilty pair, and in a court play has the actors insert a scene like that of his father's murder, that he may observe its effect on the usurping king. The latter's confusion confirms the ghost's revelation; but Hamlet, distracted between his duty of revenge and his inability to form a plan, contemplates his own suicide. "To be or not to be"—to live or die—he muses bitterly, "that is the question"—

Whether 'tis nobler in the mind to suffer
The slings and arrows of outrageous fortune;
Or to take arms against a sea of troubles,
And, by opposing, end them? To die: to sleep;
No more; and, by a sleep to say we end
The heartache, and the thousand natural shocks
That flesh is heir to, 'tis a consummation
Devoutly to be wished. To die, to sleep;
To sleep: perchance to dream: ay, there's the rub;
For in that sleep of death what dreams may come
When we have shuffled off this mortal coil,
Must give us pause. There's the respect
That makes calamity of so long life;
For who would bear the whips and scorns of time,
The oppressor's wrong, the proud man's contumely,
The pangs of despised love, the law's delay,
The insolence of office, and the spurs
That patient merit of the unworthy takes,
When he himself might his quietus make
With a bare bodkin? Who would fardels bear,
To grunt and sweat under a weary life,
But that the dread of something after death,
The undiscovered country from whose bourn
No traveller returns, puzzles the will,
And makes us rather bear those ills we have
Than fly to others we know not of?
Thus conscience does make cowards of us all;
And thus the native hue of resolution
Is sicklied o'er with the pale cast of thought,
And enterprises of great pith and moment
With this regard their currents turn awry,
And lose the name of action.

While Hamlet thus postpones revenge, the king resolves on Hamlet's instant death. Before he can effect it, Hamlet by accident has slain old Lord Polonius; whereupon the daughter of Polonius, Ophelia, a gentle girl with whom Hamlet is much in love, goes insane and drowns herself. Polonius' son, Laertes, swears hot revenge, and is thereupon ensnared by the king to carry out his own designs. A duelling match is planned with Hamlet, wherein Laertes, by the King's advice, shall use an untipped foil, poisoned at the point, while the king will furnish a cup of poisoned drink to quench Hamlet's thirst. In this tragic duel and end of the play, Hamlet is indeed slain as planned, but in the scuffle Laertes himself is pierced with his own envenomed sword. The queen by mistake drinks the poisoned cup and dies, and Hamlet in the instant of his death stabs the wicked king. About the only comic relief to the play is the dialogue of the grave-diggers who dig the grave of "the fair Ophelia."

HAMPDEN, JOHN (1594-1643). "Patriot" Hampden lives in history as one of the most gallant and determined of the band of Puritan statesmen who opposed the autocratic government of Charles I and brought on the English Civil War. He was a man of wealth and position, a cousin to Oliver Cromwell, and one of that leader's ablest supporters and advisers.

By refusing to pay the illegal ship-money tax levied by the king, Hampden became a popular hero and a central figure in the early stages of the Puritan Revolution. At his trial in 1637 seven of the 12 judges voted against him, but public opinion was in his favor and the opposition to the government was immeasurably strengthened. In the early days of the memorable Long Parliament (1640-60), Hampden was right-hand man to the redoubtable John Pym, then leader of the Puritan cause, and was one of the five members whose attempted seizure by King Charles on Jan. 4, 1642, led rapidly to war.

When hostilities began, Hampden joined the parliamentary army, contributed liberally to its support, raised a regiment of infantry, and in the struggle displayed great bravery and generalship. He was mortally wounded at Chalgrove Field, June 18, 1643, and died June 24. Such was his capacity as a statesman and a soldier that the historian Macaulay has said that, if he had lived, he would have been "the Washington of England."

HANCOCK, JOHN (1737-1793). The name of this Boston patriot, written in a large bold hand, heads the list of the signers of the Declaration of Independence. From this circumstance came the common phrase, "to give one's John Hancock," meaning to sign one's name; and from it also the name of John Hancock has gained an enduring fame, which his actual importance scarcely warrants.

John Hancock did, however, play a considerable part in the events leading up to and following the Revolution. He was a wealthy Boston merchant, and in 1768 the royal commissioners of customs provoked a riot by attempting to seize his sloop, the *Liberty*, for non-payment of duties. If the government was able to collect in this case, it could also collect for previous importations, and Hancock, along with other merchants, was threatened with ruin. In part, his opposition to the Crown was no doubt due to this business interest; and it is said that, when his interest required, he violated the non-importation agreements of the colonies and imported a good deal of tea from England.

But whatever Hancock's motives may have been, from 1768 on he was active in his opposition to the British Crown. In 1770, after the "Boston Massacre," he was one of the committee that went to the governor to demand the removal of British troops from the city, and at the funeral of the victims he delivered an address which led to an order for his arrest. He was president of the revolutionary "Provincial Congress" which met at Concord and later at Cambridge, and his arrest was one of the

objects of the British expedition to Concord which precipitated the battle of Lexington and Concord and began the Revolutionary War.

Hancock was elected president of the Second Continental Congress in 1775 and held that office two years. In 1780 he became the first elected governor of Massachusetts, and was annually re-elected, with an interval of two years (1785-1787), until his death. The support which he was finally induced to give to the Federal Constitution in 1788 was the decisive factor in the struggle for ratification in Massachusetts, and in setting the new plan in operation.

Despite the jealousy and vanity which limited his work, Hancock was a man of strong common sense and sound patriotism, and it meant much to the cause of the colonies to have the support of his wealth, social position, and education, when many of the upper class were Loyalists, or "Tories," as their enemies called them.

HANCOCK, WINFIELD SCOTT (1824-1886). One of the best all-round soldiers among the Union officers of the Civil War was Winfield Scott Hancock. He received his military training at West Point, graduating in 1844, and gained experience in the War with Mexico. He was a captain when the Civil War broke out, and was soon commissioned brigadier-general and helped to organize the Army of the Potomac. He did gallant service in the battles of South Mountain and Antietam (1862). At Fredericksburg (December 1862) he led his corps in a desperate attack on Maryes' Height through a deadly fire, from which less than 3,000 of the original 5,000 came back. At Gettysburg (1863) it was said that his appearance on Cemetery Ridge on the first day of the battle was equal to reinforcement by an army corps. Men who were fleeing stopped and the troops were restored to order.

General Hancock was in command of the Second Corps, and it was his forces which, on the last day of the battle, stopped the terrible charge of Pickett's men and deprived the South of all hope of victory. During this attack Hancock was seriously wounded, but he stayed on the field until the victory was won. After he recovered from his wounds, he bore an important part in the hard-fought battles of the Wilderness, Spottsylvania, and Cold Harbor, in 1864. At Spottsylvania he carried the Confederate works known as "the bloody angle," capturing 3,000 prisoners. For his notable services Hancock was promoted to the rank of major-general in 1866.

In 1880 the Democratic party made him their candidate for the presidency, but in the election he was defeated by James A. Garfield, who in addition to an honorable military career had long been a leader in Congress. Hancock remained in the army until his death, serving his country for over 40 years. He was a brave fearless leader and an able commander. McClellan called him "superb," and Grant wrote: "Hancock stands the most conspicuous figure of all who did not exercise a separate command."

HAND. Whatever men have done that distinguishes them from the brutes has been done by their brains. But the hand has been the instrument of the brain in bringing about almost all of these successes. The cultivation of the soil, mining, building, manufacturing—sculpture, painting, literature—what could man have done without his hands? Can you imagine this book to be written, printed, bound, and distributed without hands? Apart from the hand, speech is the only important instrument of the brain that distinguishes man from the lower animals.

The human hand is indeed a wonderful piece of mechanism. Placed at the end of the arm, with the ball-and-socket joint at the shoulder, the hinge joint at the elbow, and a peculiar joint at the wrist, the movements of the hand are indeed marvelous.

The eight bones of the wrist are called "carpal" bones, the five of the palm are the "metacarpals," and the 14 in the fingers are the "phalanges." These phalanges are so called because they are arranged in ranks, as were the Greek soldiers in the military formation known as the "phalanx." All these bones are bound together by tough flexible ligaments.

The muscles that move the hand are mostly upon the forearm, and have long tendons by which the pull of the muscles is communicated to the different joints. You can feel and see some of these tendons in your wrist when you bend your fingers. There are more than 30 pairs of muscles producing hand motions.

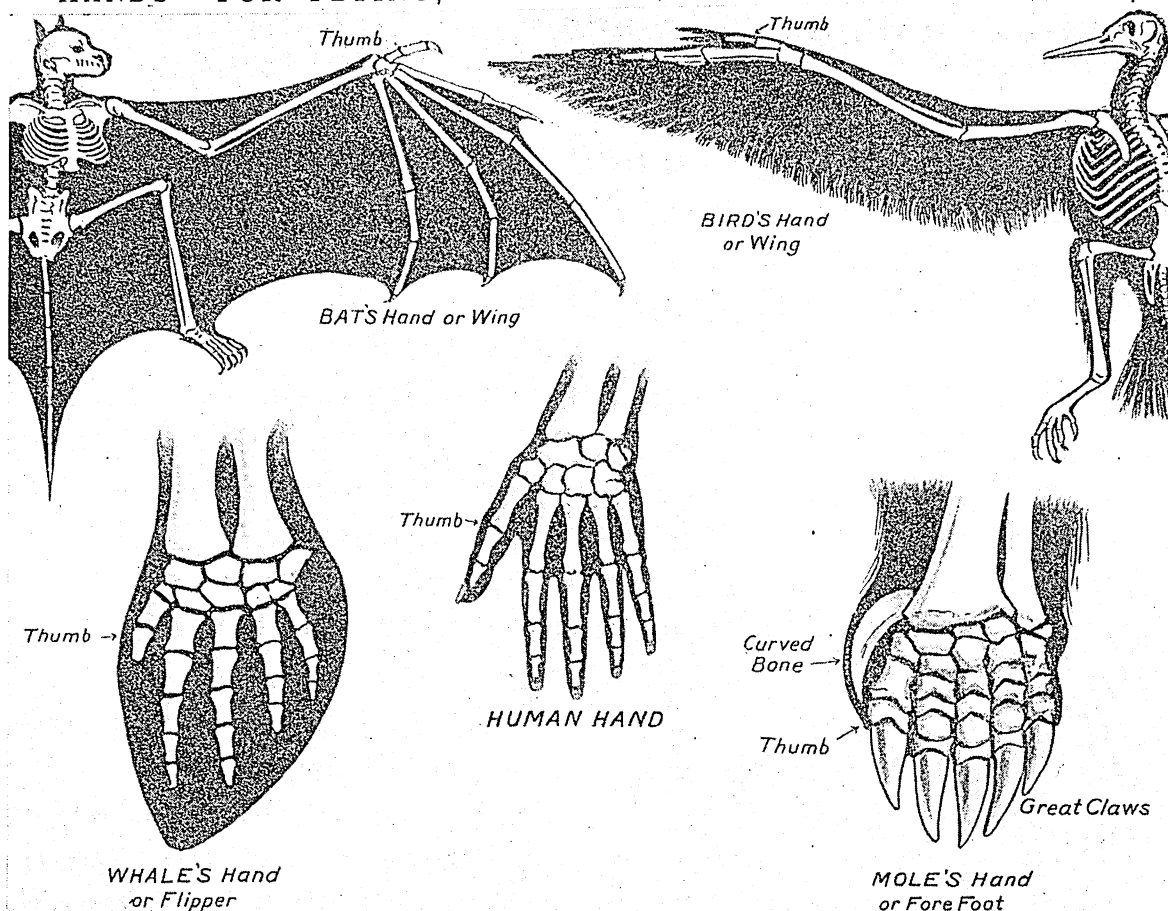
The thumb is arranged so as to work against the fingers in very useful grasping movements. Just "make believe" that you have no thumb and try to pick up something or to write or to use a fork!

The sensibility of the hand is more highly developed than in most other parts of the body. There are many little elevations or *papillae* on the skin of the palm, and fine nerve fibers extend from these to the brain. Thus the skin is made very sensitive to touch, heat, and cold.

Because it possesses both strength and lightness of touch, the hand is wonderfully adaptable to all sorts of uses. The flexible fingers can grasp large objects firmly and manipulate delicate machinery, while the nails on the tips make it possible to pick up very small things. The same hand that wields the hammer may adjust the minute parts of a watch. The lightning-like rapidity with which trained finger muscles can perform tremendously complicated tasks, such as the fingering of violin strings by a Kreisler or the rippling of piano keys by a Paderewski must always seem a miracle to the ordinary man.

While the human hand is the most completely developed in the animal kingdom for all-round purposes of protection, strength, blows, grasping, delicate movements, and sensitiveness, it is interesting to note that the fore limb of all mammals is formed on the same general plan. The horse's front hoof is just a modified finger nail; all the fingers but one have disappeared or are represented only by the remnants called "splints." In these animals the modifications

"HANDS" FOR FLYING, SWIMMING, DIGGING, AND GRASPING



While the human hand is the most perfect instrument of all, other creatures also have "hands" adapted to various purposes. The fingers of the bat, as you can see, have grown very long to support his wings, the "thumb" remaining free to be used as a clinging hook. The bird's "hand" has lost almost all its fingers, stiff feathers taking their place. The whale's hand is broad and short, but all the fingers are plainly represented. The mole not only has the usual five digits, but also an extra bone to make his digging palm even broader, and his "fingernails" have developed into huge claws.

are for purposes of speed in running. In the bat, very long fingers are developed to support the web which, instead of feathers, constitutes the "wing" in those flying mammals. The beaver's hand has a still different form, adapted to its mode of life. The mole has a broad shovel-shaped hand. Even the whale has a fore limb which has the modified structure of a hand. **HANDBALL.** A game in which a ball is hit with the hand against the walls of a court began in Ireland about a thousand years ago. For hundreds of years, this game called handball was little played except in Ireland. Then, in the 1880's, the Irish brought it to the United States. On the first handball courts built in Brooklyn, N. Y., the game was shown to be so fast and lively that athletes the nation over wanted to try it. Today most of the large gymnasiums have handball courts, where men regularly test their skill, speed, and endurance.

Handball is played either on a four-wall court or a one-wall court. *Four-wall handball* is the game

which originated in Ireland. *One-wall handball*, to be described later in this article, was developed in New York City about 1900 from the four-wall game.

Four-Wall Handball

The diagram on the next page shows the arrangement of a standard four-wall court. The back wall is lower than the other walls, and above it is a gallery where the referee and the scorer are stationed and from which spectators may watch the game.

A black rubber ball is used, $1\frac{7}{8}$ inches in diameter and $2\frac{3}{10}$ ounces in weight. Though soft, it can sting the bare hands on its lively rebound from the walls. Hence many players wear special gloves in addition to the usual track suit, wool socks, and heavy-soled tennis shoes.

Two, three, or four persons may play. When two play, one is the *server*; the other, the *receiver*. When three play, the server is opposed by two receivers. When four play (doubles), the server and his partner form the *serving side*; their opponents, the *receiving*

side. The ball may be struck with either hand, but not kicked.

In serving, the server must stand in the *service zone* between the *short line* and the *service line*. He must drop the ball to the floor within the service zone and then strike the ball on the bounce so that it hits the front wall first and, on the rebound, lands on the floor *behind* the short line. A served ball landing in front of this line is a

short. Two shorts in a row score an *out* against the server. He then becomes the receiver, and his opponent becomes the server. In doubles, the server's partner must stand in the *service box* with his back to the wall until the ball passes the service line.

The receiver must stand *behind* the short line while the ball is being served. He must play the serve either on the fly or the first bounce so that the ball returns to the front wall without hitting the floor. Then the server hits the ball on its rebound from the wall, and play continues with the opponents alternately hitting the ball until one of them fails to return it legally to the front wall.

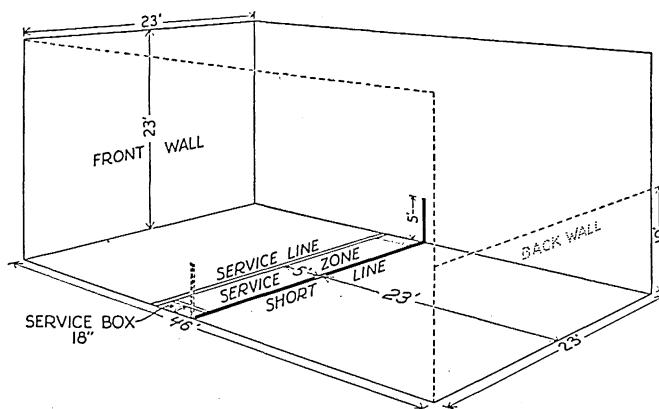
If the server fails to make the return, an *out* is scored against him, and he then becomes the receiver. If the receiver fails to make the return, a *point* is awarded the server, who continues to serve until he is out. Thus only the server or the serving side scores points. A game is 21 points; a match, the best two out of three games.

The rules permit a served ball, after hitting the front wall, to strike one side wall before landing behind the short line. A returned ball is permitted to strike the side walls and ceiling before hitting the front wall. From there the ball may bound clear to the back of the court and may be played from the back wall. The lightning speed with which the ball bounces about the court makes the game very interesting to watch.

One-Wall Handball

One-wall handball is played on a court having a wall 20 feet wide and 16 feet high. The court is 20 feet wide and 34 feet long. The same ball and the same system of scoring are used as for four-wall handball. Two or four persons may play. In a fast game, con-

STANDARD FOUR-WALL HANDBALL COURT



This diagram gives the measurements of a handball court and for clarity labels the walls and floor. The ceiling is not shown. The lines on the side walls at the short line are designed to help the referee call serves.

siderable skill is required to keep the ball within bounds since the court is open on three sides. The one-wall court permits the game to be watched by more spectators than the four-wall court and it costs less to build. The wall is often built long enough so that several courts can be laid out on both sides of it. This makes the one-wall game popular at playgrounds as well as in gymnasiums.

HAN'DEL, GEORGE FREDERICK (1685-1759). The name Handel suggests Christmas and the 'Messiah', with its glorious Hallelujah Chorus. This oratorio of his has for so many years been given in connection with the holiday festivities that it has come to be a tradition of the season.

Although Handel was born a German, he won his first great fame in Italy with his Italian operas. He later became an English citizen and is today chiefly remembered for his English oratorios.

The father of Handel, a German doctor of Halle, was much opposed to his son's musical ambitions. But the boy was obsessed with a desire to learn to play the spinet (an early form of the piano), and at the age of eight years had taught himself. When an opportunity was presented for him to play the organ in the castle of a neighboring duke, he did it so skillfully that the duke persuaded the lad's father to give his son a musical education. The boy at once became a pupil of the organist of the Halle cathedral.

At the age of 11 he was master of the organ, clavichord, violin, and other instruments, and was proficient in musical composition. When 20 years of age he produced his first opera, which was favorably received. He went to Italy to study the Italian style of opera, and there his brilliant performances on the harpsichord surprised audiences by their rare beauty.

Handel next went to London, where his triumph was repeated. England offered so much in the way of opportunity and appreciation that when 41 years of age Handel became a naturalized Englishman.

Seven years later he began his career as an English composer, using from that time only English texts for his oratorios. It is to these that his greatest fame is due.



GEORGE FREDERICK HANDEL
Master of the Oratorio

Other musicians were composing operas, but English oratorio, as composed by Handel, was an innovation. The English people loved his music, and the royal family were always his staunch supporters. Handel grew old, blessed by the comfort of his music and many friends. The bitterest trial of his life came in his later years, when he became totally blind. Yet, he still played and conducted his oratorios.

Handel will never cease to be revered as one of the greatest of composers. Besides his 18 English oratorios, his works include 41 Italian operas, 2 Italian oratorios, 4 English secular oratorios, 3 volumes of English anthems, 1 volume of Latin church music, 3 volumes of Italian vocal chamber music, 37 instrumental duets and trios, and 4 volumes of orchestral music and organ concertos.

HANDWRITING. Every boy and girl is ambitious to "write a good hand" and to do this rapidly. Success in obtaining and in holding a business position often depends upon the candidate's penmanship. Hence these suggestions in regard to handwriting should be carefully considered.

Learning to write is an example of the development of manual skill, and the general principles of this sort of learning apply to it. The most important principle is repetition. We learn to make a new movement by the "trial and error," or the "cut and try," method. Nobody can tell the beginner just how to do it; he has to learn for himself. Furthermore, he cannot learn for himself by thinking it over and theorizing about how it should be done. He must try over and over again, each time trying to do it a little better.

Mere repetition, as is implied in the last sentence, is of no use. One may write a great deal and still write continually worse. The pupil, while he is practicing, must continually observe his writing closely, compare it with former specimens of his writing, and with a model which is superior to his own.

In practice a balanced emphasis should be placed on the two aspects of speed and quality. Both speed and quality should be moderate in the beginning, and should improve together. Over-emphasis on speed produces a scrawl, and over-emphasis on quality or form produces labored writing, which is apt not to be so good, even in form, as more fluent writing. As practice is prolonged, the writing becomes automatic. It may be carried on while the attention is chiefly occupied with something else. Writing should not become automatic before the quality is sufficiently good, nor should automatization be put off after this point has been reached.

The kind of drill in writing should be carefully adapted to the age and maturity of the learner. It is well for the beginner to write for several months on the blackboard alone. The large free movement of the whole arm at the board is much easier to control than the more delicate movement of the pen or pencil. When the child first writes on paper he should use a soft smooth pencil, and should write a coarse hand

on large sheets of comparatively rough paper. The pen may be introduced in the third grade. Intensive drill on minute details of form should be deferred until the fourth grade or above.

The ease and quality of writing depends a good deal on position. The writer should face the desk squarely and rest both arms on it lightly for about three-quarters of their length. The paper should be directly in front of the writer, with the top tilted about 30 degrees to the left. The pen should be grasped lightly, and the hand held with the palm pretty well down and sliding easily on the nails or the first joints of the last two fingers. The writing should be carried on with a free, easy, rhythmical movement, which may be developed with the aid of counting. It is important that the hand move freely to the right while the letters are being formed.

The very strongly left-handed writer should not be forced to use his right hand. For him the position of the paper should be reversed, and he may be allowed to write back-hand.

HANG'CHOW, CHINA. When Marco Polo, the greatest of medieval travelers, visited Hangchow near the end of the 13th century, he was so transported with the number and splendor of its mansions and the wealth and luxury of its people that he declared it was the finest and noblest city in the world. It still ranks as one of the richest cities of China, though it lost much of its ancient magnificence when it was laid in ruins by the Taiping rebels in 1861. Its shops are noted for their size and the excellence of their stocks, and its manufactures of silk, paper fans, tapestries, ivory carvings, and lacquered ware are world famous.

Hangchow, which is about 100 miles southwest of Shanghai, lies near the head of the estuary of the Tsien-tang River, 50 miles from the ocean. Although the river is visited at certain seasons by destructive "bores"—great tidal waves 15 feet high which rush up-stream at the rate of 15 miles an hour—it is constantly crowded with small craft which transport vast quantities of merchandise to and from the southern provinces. An immense amount of traffic is also carried by the Grand Canal, which ends here.

But above all it is a city distinguished for its heritage of culture and for its beauty. The Chinese say, "Heaven above, Soochow and Hangchow below." The old city, now partly modernized, lies on the shore of Si-hu or West Lake, at the foot of the Eye of Heaven Mountains. Its monasteries and splendid Buddhist temples attract thousands of pilgrims and visitors. From the 10th to the 13th centuries it was the capital of southern China. In 1896 it was opened to foreigners for trade. It was seized by Japan in 1937 but was little damaged. Population, about 685,000.

HANKOW', CHINA. Though Hankow is 600 miles from the sea, it is one of the world's great ports. Ships of all nations steam up the Yangtze River from Shanghai to this noisy, crowded city far inland in Hupeh province. It stands at the junction of the Yangtze

and the Han. Across the Han is the city of Hanyang, and on the south bank of the Yangtze is Wuchang, capital of the province. This "Triple City" of Hankow, Hanyang, and Wuchang is called Wu-Han, and is the industrial and commercial heart of central China.

The Triple City is so centrally located that the Chinese call it "The Collecting Place for Nine Provinces." Ships drawing 30 feet can reach it from Shanghai. It is about midway on the Canton-Peiping (Peking) railway, and roads and waterways fan out from it to all parts of the vast Yangtze plain. To its mills and factories and docks come hides and skins, wheat, tobacco, cotton, silk, rice, beans, tung nuts, tea, sesame seed, iron, coal, and antimony.

Of the three cities, Hankow is the most important. Opened to foreign trade in 1858, its chief business is exporting. Junks, steamers, and lighters usually crowd the yellow surging river. In the native quarter, wheelbarrows and shouting groups of bargaining shopkeepers and customers clog the narrow streets. But the foreign concessions and business sections are imposing and efficient.

Ancient Wuchang is chiefly a receiving center for inland trade. Hanyang is industrial, and China's first modern iron smelter was built here in 1890, followed by a steel mill. For some years Hanyang gave promise of becoming a giant producer of iron and steel, but financial troubles halted production. All industry and trade of the Triple City dwindled after it was attacked and occupied by Japan in 1938, and large numbers of the population of about 1,500,000 fled from the severely damaged area.

HANNIBAL (about 247-183 B.C.). "I swear that so soon as age will permit, I will follow the Romans both at sea and on land. I will use fire and steel to arrest the destiny of Rome." The boy Hannibal stood at the altar beside his father, the great Carthaginian general Hamilcar Barca, and repeated this solemn oath of enmity against his country's powerful rival. The warrior and his young son were setting out together for Spain, where Hamilcar hoped to gain conquests that would compensate Carthage for the possessions that Rome had wrested from it in the disastrous war recently ended—the First Punic War. He was taking Hannibal with him that he might learn the ways of war and prepare to renew the death-struggle with Rome for the supremacy of the Mediterranean.

So well did Hannibal learn his lesson that after his father's death he succeeded to the command of the army in Spain, and three years later (218 B.C.) was prepared to renew the contest to which he had been dedicated. While the Roman senate was planning to invade the Carthaginian domains, Hannibal was already starting on the most daring march known to the ancient world.

Along the eastern coast of Spain, over the Pyrenees Mountains, and across the swift waters of the Rhone, he led his forces of 50,000 foot soldiers, 9,000 horsemen, and scores of elephants. It was already autumn

and the cold was intense when this band, accustomed to the sunny lands of Africa and Spain, began to cross the perilous Alps. Blinded and almost overwhelmed by snowstorms, over steep and narrow paths they struggled, cheered and encouraged by their dauntless leader. In places the natives rolled heavy stones down the mountain sides upon them; many men slipped down the icy precipices and were killed; others perished of cold, hunger, and exhaustion, so that the army was reduced to less than half its original number when it descended upon the plains of northern Italy.

By the skilful use of his cavalry, in which the Romans were weak, Hannibal won two great victories, at the Trebia River and at Lake Trasimene. Alarmed at these disasters, which had shattered one army and nearly destroyed another, the Romans appointed a dictator—an official invested with extraordinary power. Their choice fell upon a wise statesman named Quintus Fabius Maximus. Instead of risking an engagement at once, Fabius adopted a policy of following the Carthaginian army, delaying it and harassing it in every possible way. From this he was nicknamed *Cunctator*, or "delayer," and even to this day cautious generals who practice similar tactics are said to pursue a "Fabian" policy.

At last, in the summer of 216 B.C., a Roman army of between 70,000 and 100,000 met Hannibal's band at Cannae, near the southeastern coast of Italy. Though far outnumbered, Hannibal managed by clever strategy to surround the forces of his enemy and annihilate them. Ex-consuls, senators, nobles, thousands of the best citizens were among the 60,000 slain. Of the gold rings which they wore as an indication of their rank, Hannibal is reported to have sent a bushel to Carthage.

Won a Great Battle but Lost the War

But the victory bore little fruit, for Hannibal was one man fighting against a nation. He failed to receive support either from his own countrymen or from the Italians that he subdued during the 15 years that he remained in Italy. His brother Hasdrubal, coming to his aid with reinforcements from Spain, was met by a Roman force, completely defeated, and slain. His severed head was hurled into the camp of Hannibal, who anxiously awaited him. Still Hannibal struggled on, until a Roman army under Scipio Africanus invaded Carthage and he was forced to return home. At Zama in his own country, the lion-hearted commander who for 15 years had ravaged Italy suffered a crushing and final defeat. The long battle for supremacy was ended and Rome was mistress of the Mediterranean.

Hannibal now showed that he could be a statesman as well as a soldier. Elected chief magistrate, he reformed and strengthened the government of Carthage and contrived to pay, without hardship to the people, the heavy tribute exacted by Rome. The Romans, alarmed by this prosperity and by the charges of his enemies that he was plotting to renew

the war against Rome, demanded Hannibal's surrender. To avoid falling into their hands, he fled to Asia, and when several years later the Romans hunted him out, he took poison, which, we are told, he always carried with him in a ring.

So died one of the greatest and most gifted military leaders of ancient times; an ardent patriot, a crafty strategist, and the most formidable foe that ever threatened the Roman Republic at the height of its power. (*See Carthage.*)

HANOVER, GERMANY. For about 120 years the kings of Great Britain were also German princes, ruling the kingdom (formerly electorate) of Hanover in northwestern Germany. This state of things lasted from the accession of George I, the first of the Hanoverian (or Brunswick) dynasty, in 1714, until the death of his great-great-grandson, William IV. Owing to a law forbidding female succession in Hanover, that land passed to another ruler when Queen Victoria ascended the British throne in 1837. In the war between Prussia and Austria, in 1866, Hanover was allied with Austria, and victorious Bismarck thereupon annexed it to Prussia, of which it still remains a part. The area of this Prussian province is now 14,897 square miles, and its population about 3,540,000.

The city of Hanover, the capital of the province about 60 miles southeast of Bremen, contains an irregularly built "old town," with many quaint stucco-front houses, and handsome new quarters to the north and east. There are many fine parks, picture galleries and museums, a palace with magnificent decorations, and other fine buildings. Numerous manufactures—hardware, chemicals, machinery, linen, tobacco, etc.—have contributed to the city's rapid growth in the past half-century. For many years foreign students—especially English—studied in Hanover, on account of the reputed purity of the German spoken there. Population of the city, about 475,000.

HANSEATIC LEAGUE. A fleet of tall-masted ships met in the sound off the coast of Denmark in the spring of 1368. They came from the cities of northern Germany belonging to the Hanseatic League, which was at war with the king of Denmark. For two years they harassed the Danish coasts and waters, sacked Danish cities, and plundered their treasures. At the end of that time the king of Denmark was glad to make peace, although the terms exacted were most humiliating. The cities of the League demanded a share in the Danish revenues for 15 years, the possession of Danish strongholds, and the final voice in the selection of the Danish kings.

This episode in the history of the loose confederation of North German cities known as the Hanseatic League gives an idea of the power it then possessed. It had been growing up gradually. No one knows just when it began. More than a hundred years earlier cities had formed alliances or "hansas" to protect their traders from the plundering barons

along the highways and the pirates upon the seas. These alliances proved so useful that gradually more towns joined the strongest league, of which Lübeck was the center, and this union became known as the Hanseatic League.

Just how many towns were in the league no one knows. Even its ambassadors in London, when asked for the number of towns, scornfully replied that they could not be expected to know all the places, large and small, in whose name they spoke. At the height of its power in the 14th century it probably contained nearly 100 cities, extending from Dinant in Belgium to Cracow in Poland, and its "factories" or trading-posts stretched from the "Steelyard" in London to the "Court of St. Peter's" in the far-away city of Novgorod, Russia.

In these foreign factories the representatives of the league lived almost like monks. They were forbidden to marry as long as they remained abroad. They could not leave the factory at night. Iron doors, savage dogs, and watchful guards were provided to enforce this rule. They could not associate with the people of the country except for business purposes, and they were required to be rigidly honest in their dealings, for the dishonesty of one would bring the wrath of the townsmen upon all.

But the advantages more than balanced these restrictions. Merchants of the league were exempt from the taxes and tolls levied upon others. And in some places they had a monopoly of a certain trade, as of the herring fisheries off the coast of Sweden. At the height of its power the league not only protected its merchants but also maintained its fleet and even engaged in war to safeguard its interests. It played an important part in suppressing lawlessness, in carrying comforts and conveniences into half-barbarous lands, and in promoting enlightenment and civilization throughout northern Europe.

But quarrels between the towns gradually weakened the influence of the league, for it was only a loose union whose assembly met every year or two, but had no authority to enforce its decisions. The rise of strong political states such as Denmark created rivals and enemies for the Hansa. The discovery of America and of the route around Africa lessened the commercial importance of most of the North German cities. But the death-blow to the league came when the herring suddenly deserted their haunts off the shores of Sweden for the coast of Holland. The exclusive control of the herring fisheries had been the most highly prized privilege of the league, and with that gone the members lost interest. By 1630 most of the towns had deserted the alliance, but the free cities of Hamburg, Lübeck, and Bremen continued to be known as Hansa towns until the latter part of the 19th century (*see Bremen; Hamburg*).

HAPSBURG. On the top of the Wülpsberg (1,682 feet high), in northern Switzerland near the junction of the little river Reuss with the Aar, stands the ruined "Hawk's Castle" (*Habichtsburg*) which

WHEN HANNIBAL CROSSED THE ALPS

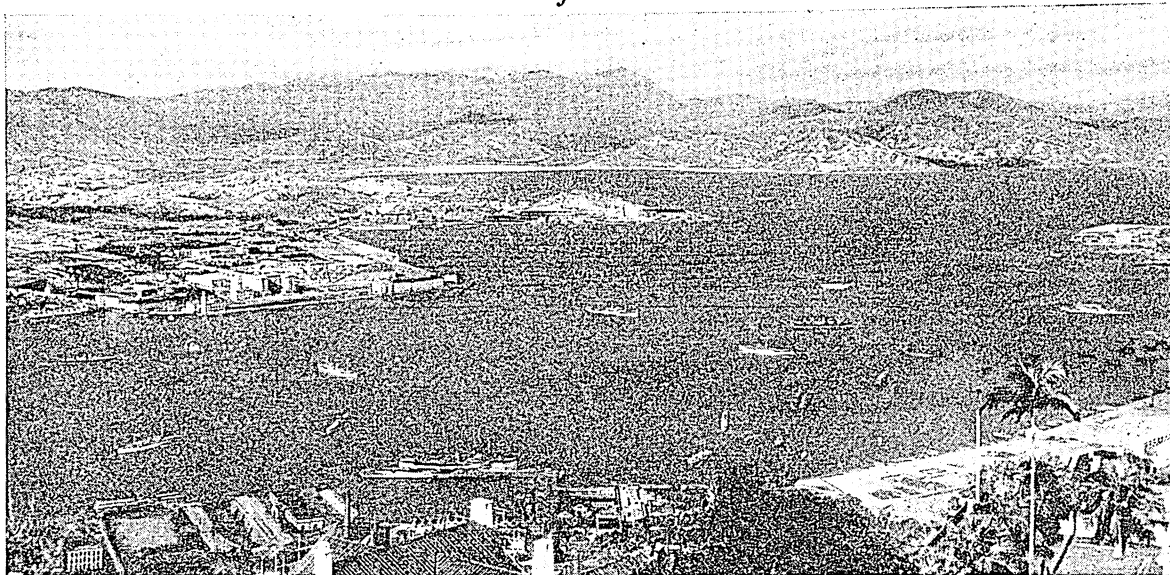


Here stands Hannibal, with members of his staff, directing the passage of the Carthaginian army over a dangerous spot, in the famous march from Spain across the Alps to Italy. Beset by hostile natives, exposed to the rigors of an Alpine winter, with insufficient food, and without anything approaching modern means of transport, the task of Hannibal's army was stupendous. The success with which this seemingly impossible enterprise was carried out is still a marvel to military men.

was the original seat of the famous Hapsburg (or Habsburg) family. The castle was erected in 1020, and its owners ruled Austria from 1278 to the end of the World War of 1914-1918. With only one exception (Charles VII, 1742-1745), all the rulers of the Holy Roman Empire from 1438 until the abolition of the empire in 1806 were members of the Hapsburg house. The Emperor Charles V (1519-1556) was by descent

on his father's side a Hapsburg (*see* Charles V, Holy Roman Emperor). After the division of his dominions there were two Hapsburg houses, one ruling Spain, until the extinction of the line in 1700, and the other Austria. A full lower lip and a long pointed chin—the famous “Hapsburg chin”—became family features after a marriage with a Bohemian princess in the 15th century. (*See* Austria-Hungary.)

SHELTERED HAVENS *for the* WORLD'S SHIPS



From the heights of Victoria, on Hong Kong Island, we look across the ten square miles of its land-locked harbor toward Kowloon Peninsula and the Chinese mainland. Hong Kong is the chief port of southern China, rivaling Shanghai in the tonnage it handles. From ocean vessels cargoes are transferred to river craft or railroad cars for shipment to Canton.

HARBORS AND PORTS. The destiny of nations is to a great extent influenced by their coast lines. Commerce, with the progress in civilization which follows on its heels, most readily springs up where there are well-sheltered harbors in which ships may safely load and unload their cargoes. Despite its vast potential wealth, Africa, with the exception of the narrow strip along the Mediterranean, remained undeveloped until the 19th century largely because it has so few natural harbors. On the other hand, the civilization we enjoy today was born in the Mediterranean lands, where many safe harbors tempted men to traverse the sea and interchange products and ideas. One of the controlling factors in bringing about the differences between the “unchanging East” and the changeful West has been the abundance of harbors in Europe and their comparative scarcity in Asia.

The discovery of America turned the face of Europe westward, and the excellent harbors on Europe's west coast brought wealth and power to the countries owning them. Nearly all the early centers of settlement in North and South America were at some bay or river mouth which afforded shelter to the vessels of the first arrivals. The rapid

growth of the United States and its commercial and industrial importance are due in part to its long strip of coast on the two great oceans, dotted with fine harbors. In South America, Bolivia and Paraguay are hampered by the lack of seacoast. Bolivia once owned the harbor of Antofagasta, but lost it to Chile in 1883.

Rivalry between nations for harbors has brought many bloody wars, for the state without a coast line is at the mercy of any state whose territory it must cross to reach the ocean. The inland country battles for a strip of land along the sea, a single port, or even the establishment of a “free port” where its goods may be shipped without customs duties. After the World War of 1914-1918 the victorious Allies punished Austria by stripping it of its seacoast on the Adriatic and thus strangling its trade. And they rewarded the Poles by giving their restored country a corridor to the sea with unrestricted use of the German port of Danzig.

How Harbors Are Classified

Natural harbors are classed, according to their origin, as drowned valleys, deltas or river-mouth harbors, fiords, and lagoons. A good harbor must afford safe anchorage for vessels, protected from

storms, deep enough for the largest ships to come close to shore, and broad enough for many vessels, and must have a direct channel to the open water. In order that a good harbor may develop into an important port there must be the further advantages of freedom from ice and abundant room for docks, piers, wharves, loading and unloading facilities, and warehouses. There must also be a broad area for the growth of a city, and easy direct access to a productive interior. The interior should furnish products for shipment, and use raw materials brought in through the port for manufacture.

The world ports, such as New York, Baltimore, Philadelphia, San Francisco, Seattle, London, Liverpool, Hamburg, and Shanghai, owe their growth to the possession of all these advantages. These harbors are drowned valleys formed by the sinking of the

coast line, which let in the sea to deepen the mouth of the river for a considerable distance.

Rivers Cut Through Deltas to Seas

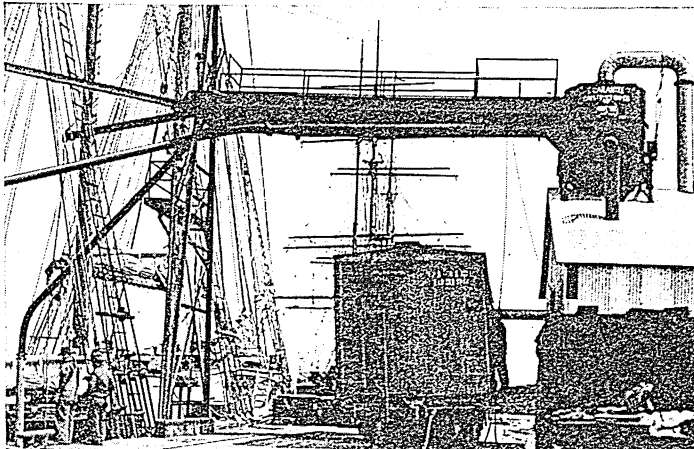
Great rivers such as the Mississippi, the Amazon, the Nile, and the Ganges are ever thrusting forward

into the sea deltas formed from the vast quantities of silt brought down by the current from distant highlands. These rivers have cut several channels through the deltas to reach the sea. The advantage of a long river route back into the continent is why such a city as New Orleans is located near the head of a delta. But great sums must be spent to dredge out the silt, and to build jetties to force the

current to scour out its own bed to deep water.

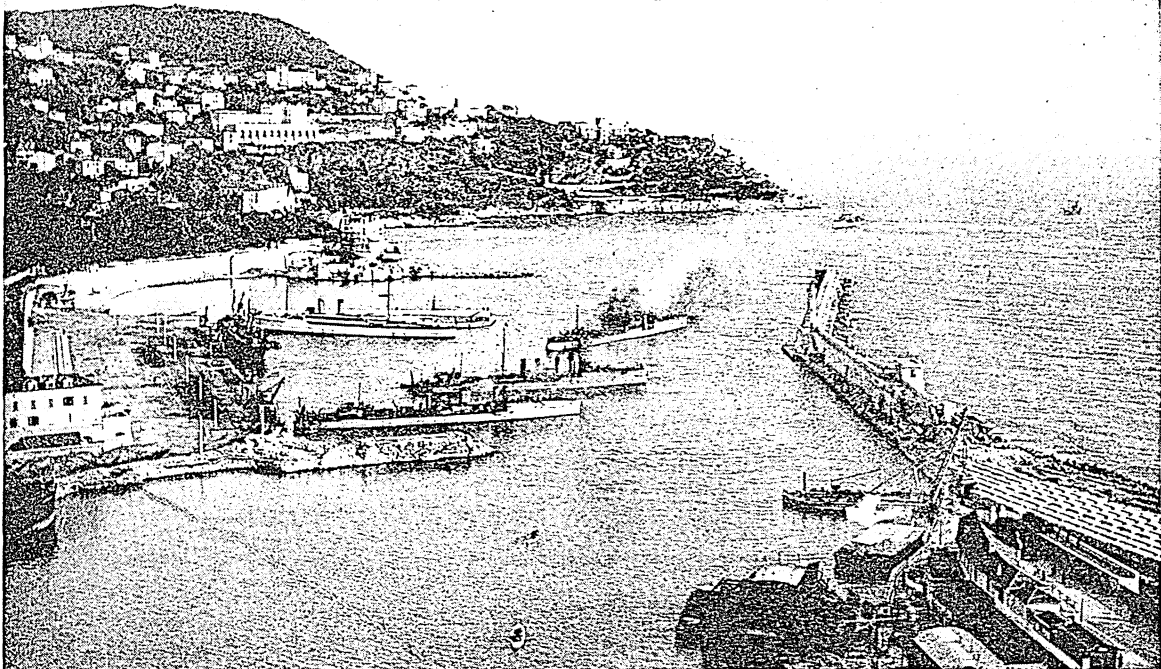
Fiords, like most of those whose entrancing beauty lures thousands of tourists every summer to Norway's western coast, can never become ports because the

A MODERN SYSTEM FOR UNLOADING



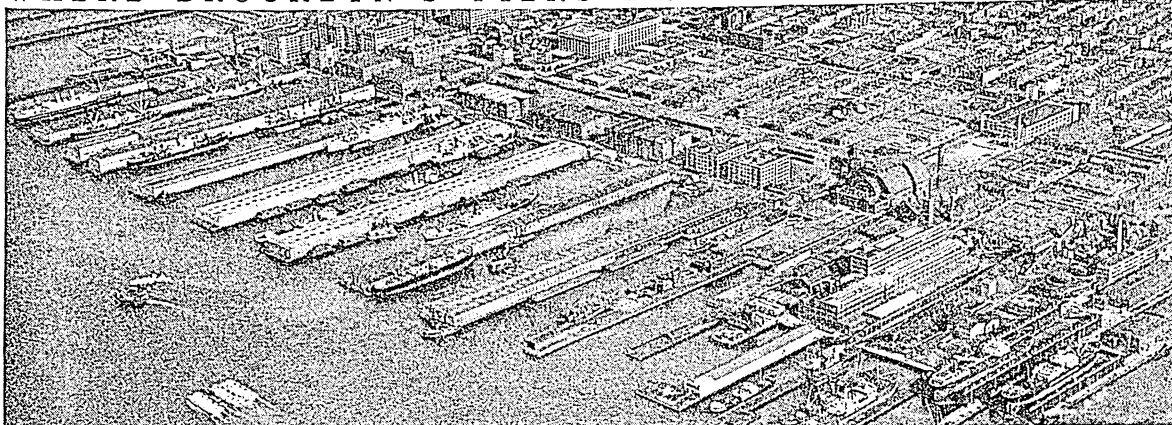
The machinery on the wharf is transferring copra (dried coconut kernels) directly from the hold of the schooner to the freight car on the track. The pneumatic tubes on the left draw up the copra, carry it over the "bridge" and deliver it into the car from the right. The building contains the pumps which provide the suction.

HELPING NATURE PROVIDE A HARBOR FOR MARSEILLES



This picture of the entrance to the so-called "old harbor" of Marseilles shows how artificial works are used to improve natural harbors. Although the land-locked bay provides good shelter for vessels riding at anchor, the French engineers have erected breakwaters to break the force of the waves across the harbor's mouth and dredged basins in order to let big ships come alongside the docks. The ships we see here are mostly French naval vessels.

WHERE BROOKLYN'S PIERS FRINGE THE EAST RIVER



When a friend sails for Europe from Brooklyn, his liner pulls away from one of these slips and glides among the swarming traffic of New York harbor and through the Narrows into the Atlantic. Wharves and piers have been built along most of the 578 miles of Greater New York's waterfront to berth the ships that carry from this port more than half of the country's exports.

steep mountain walls leave no room for a city, and bar easy communication with the interior.

Lagoons are produced by sand barriers or coral reefs. They are numerous in the southeastern United States. Galveston is an example of a lagoon harbor that has been improved to make it a splendid port.

Inland Cities Made into Ports

Inland cities have been transformed into seaports by dredged rivers and canals. Manchester, England, is connected with the ocean by the Mersey River and a canal 35 miles long, so steamers may unload cargoes directly into its mills. The largest ships reach Hamburg, Germany, 75 miles from the sea, because continuous dredging has deepened the channel of the Elbe to about 40 feet. Its vast harbor was made almost entirely by excavation. Houston, Texas, has a 35-foot canal bringing ocean vessels to its wharves. Chicago, 1,000 miles from the ocean, and other Great Lakes harbors, may some day be made seaports by the St. Lawrence-Great Lakes and the Great Lakes-Gulf of Mexico waterways.

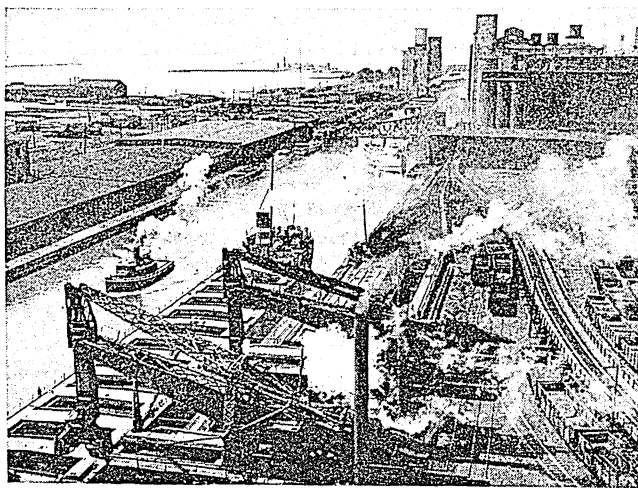
The profits of commerce more than offset the immense expense of constructing artificial harbors. Tremendous breakwaters—great walls of stone or concrete or similar material—are built far out into the ocean to break up heavy seas and afford a safe refuge. Artificial harbors are made by such breakwaters. Dover, England, has one of the largest artificial harbors in the world. More than two miles of concrete breakwaters en-

close a square mile of anchorage with a minimum depth of 40 feet. A two-mile breakwater protects the anchorage at Hilo, Hawaii, from northeast trade winds. Madras, India, on an open roadstead, has been made a port by extensive harbor works which protect ships against the monsoons.

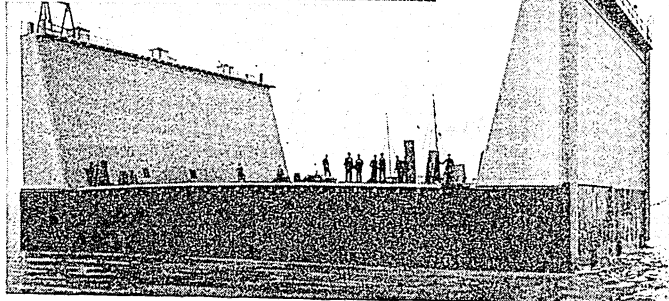
Wet Docks and Dry Docks

In harbors where there is a great range of water depth between high and low tide, as at London, Liverpool, and Le Havre, it has been necessary to construct huge wet docks, or basins, usually made

A GREAT LAKES PORT AND A DRY DOCK



Buffalo's port, at left, handles a large share of the Great Lakes shipping. Here, where the New York State Barge Canal runs into Lake Erie, we see steam cranes with clam-shell buckets, for transferring iron ore from ships to cars, and giant grain elevators. When the floating dry dock, below, submerges, a vessel floats between its walls. The water is then pumped out, so the dock's floor can rise clear of the waves, and workmen repair the ship's hull, held steady by timber supports.

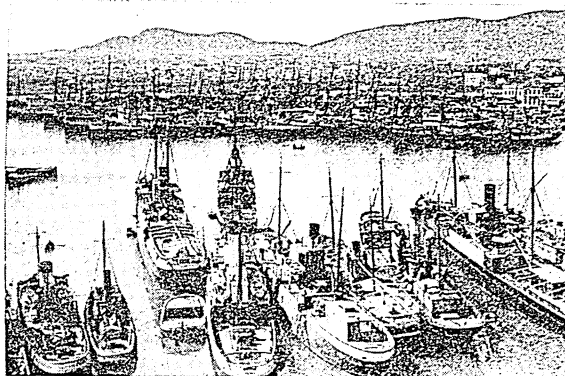


of concrete, with gates that maintain the water level when the tide runs out.

All great harbors are equipped with dry docks and other facilities for repairing ships and cleaning their hulls. A dry dock is a large basin built of concrete which can be closed with water-tight gates after a vessel has entered. The water is then pumped out or allowed to run out with the tide, the ship being held upright by "shores," or long timber supports, while workmen scrape, mend, or paint the hull. Adjoining a dry dock are repair shops.

Good harbors need constant attention. Currents and tides silt up old channels and open new ones.

GREEK ARGOSIES SAILED FROM THIS PORT

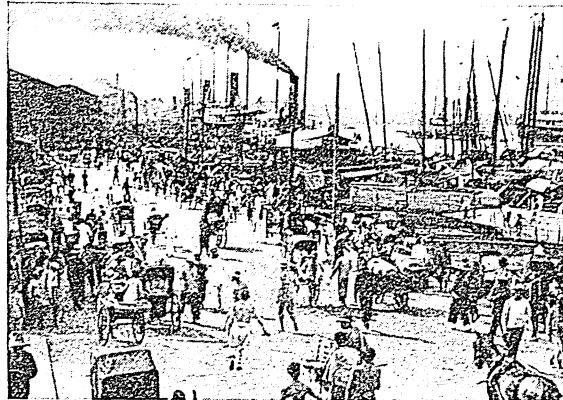


Mediterranean coastwise vessels crowd Piraeus, Greece, port of Athens. The largest of its three quiet harbors has been improved with breakwaters, quays, and dry docks. Modern Greece is reviving the sea trade that once poured through this port and helped to build the Athens of Pericles' day.

Continuous dredging is necessary to maintain navigable depths. The increasing size of liners and the growing magnitude of trade are bringing repeated enlargements of port facilities. At a cost of \$6,000,000 Ambrose Channel into New York harbor was deepened to 40 feet at low tide and widened to 2,000 feet for seven miles, and the pier and wharf capacity extended greatly. Yet this busy port is so overtaxed that an artificial port is planned at the east end of Long Island to relieve New York harbor.

The large ports have miles of piers and slips, with enormous warehouses and all the most improved devices for loading and unloading steamers—electric cranes, automatic hoists, endless belts, and pneumatic tubes and pumps which move such prod-

AT CHINA'S BUSIEST PORT



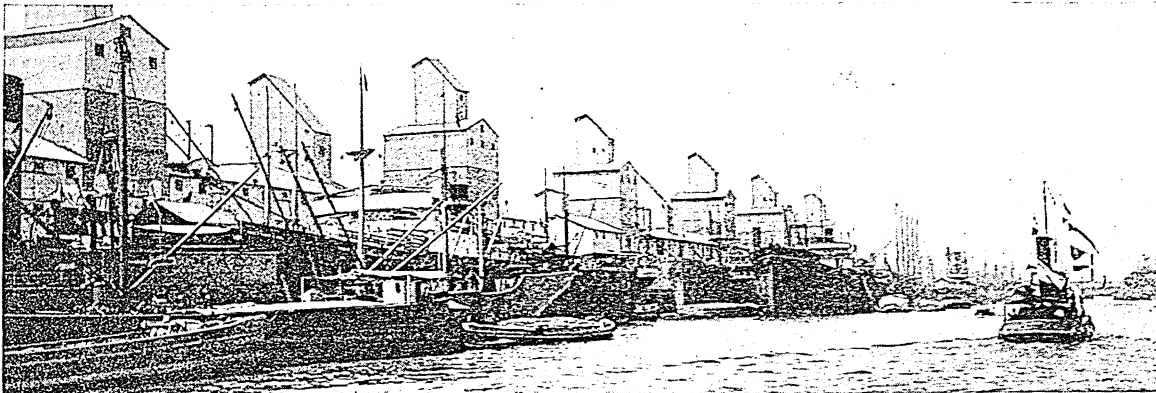
Here we see the Bund at the French Concession in Shanghai swarming with coolies, wheelbarrows, and jinrickshas as the sampans and ocean liners jostling at the wharves unload. The Whangpoo River has been deepened to admit large vessels, for this port handles half China's imports and a third of its exports.

ucts as wheat or oil from the hold of a vessel to storage buildings or to waiting freight cars.

The United States government makes large annual appropriations for harbor maintenance and improvement. Besides the continual dredging, new surveys are constantly being made and new charts prepared for the guidance of mariners. Lighthouses, lightships, beacons, buoys, range-finders, radio signals, leader cables, and other equipment to guide ships through narrow winding harbor entrances in darkness or fog must be installed, improved, and repaired if the ports are to be kept safe for navigation. (See Lighthouses and Lightships; Navigation.)

The making and maintenance of aids to navigation are duties which belong to or have been assumed by the national government, but the provision of adequate terminal facilities usually falls to state or city.

BUENOS AIRES HARBOR IN THE PLATA ESTUARY



Rows of grain elevators and warehouses line the wharves of Argentina's chief port—the outlet for stores of wheat, corn, wool, and meat from the pampas. Buenos Aires also receives four-fifths of the country's imports. Some \$50,000,000 has been spent deepening the river basin and constructing the piers, terminals, and other facilities that allow 1,500 vessels to be loaded at one time.

In the WHITE HOUSE after the First WORLD WAR

HARDING, WARREN GAMALIEL (1865-1923). Few presidents have come into office with a more difficult task confronting them than that which faced the 28th president of the United States on his inauguration, March 4, 1921.

In the first place, owing to party differences, the Versailles peace treaty, in the negotiation of which President Wilson had taken part on behalf of the United States, had failed of ratification in the Senate. This left the United States technically in a condition of suspended warfare with Germany and Austria and with no share in the new League of Nations—which, indeed, had been the chief stumbling-block to the ratification of the peace treaty. Friends of Germany and Austria were resentful at the harsh terms imposed upon those countries; an irreconcilable group of Republican senators demanded the complete "scrapping" of the League of Nations covenant; humanitarians urged that the United States aid the suffering Armenians in safeguarding their new freedom against the massacring Turks; radicals demanded that Bolshevik Russia should be given a chance to work out its salvation, while reactionaries clamored for more stringent measures against "reds" of all sorts; jingo elements labored indefatigably for sterner measures against Japan and Mexico; and the "Friends of Irish Freedom" exerted every pressure that could be brought to bear to induce the United States to recognize the independence of "the Irish Republic."

Serious Problems to Be Faced at Home

Domestic problems were equally pressing. Heavy taxation and the "high cost of living" were legacies of the war; and business demanded relief from the one while the buying public clamored for a lightening of the burdens of the other. A financial stringency and much unemployment accompanied the economic readjustment. Labor and capital were equally tenacious of advantages gained and resentful of losses incurred. The relinquishment by the Federal government of those powers of control over public necessities—such as food, fuel, and transportation—which it had perforce assumed during the war, carried with it no release from the exceptional problems arising out of these necessities in the transition to peace.

Warren G. Harding of Ohio, who was nominated for the presidency on June 12, 1920, by the Republican convention at Chicago, was a "regular of regulars," and his personality has been compared to that of his Ohio predecessor, President McKinley. He was

born in Corsica, Ohio, where his father was a local physician. He was educated at Ohio Central College, Iberia, Ohio; became the publisher of the *Marion* (Ohio) *Star*; married in 1891 Florence Kling of Marion; was elected to the Ohio senate in 1900, and to the lieutenant-governorship in 1904. He was the unsuccessful Republican candidate for the governorship of Ohio in 1910; and in 1915 was elected to the United States Senate. As a member of the Senate Committee on Foreign Relations, he had favored the ratification of the peace treaty with reservations "sufficient to safeguard the interest of the United States of America."

The Campaign

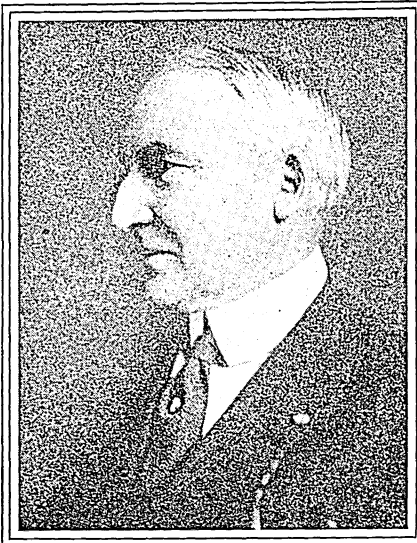
Up to 1919 it was generally believed that Theodore Roosevelt would be the Republican candidate in 1920, but his death left the field open to others. Of these, Gen. Leonard Wood, Senator Hiram Johnson of California, and Gov. Frank O. Lowden of Illinois were most prominent and had the most support among the Republican rank and file. Harding at the outset had few supporters, but when a deadlock ensued in the convention held at Chicago, the leaders agreed to his nomination. For the vice-presidency, the convention

selected Gov. Calvin Coolidge of Massachusetts.

Several candidates competed for the Democratic nomination in the convention which met at San Francisco, but ultimately the choice fell to Gov. James M. Cox of Ohio, with Franklin D. Roosevelt of New York as the nominee for vice-president.

Neither Harding nor Cox had previously been figures of national interest, and their personalities and records played little part in the campaign. In the preceding January, President Wilson had asked for "a great and solemn referendum" upon the League of Nations, and this was outwardly the campaign issue but, in reality, it was whether or not the people approved the Wilson administration. The election resulted in a tremendous landslide for the Republicans. Harding received 404 electoral votes to only 127 for Cox, and a popular plurality of about 7,000,000 votes. For the first time since 1876 one of the Southern states, Tennessee, cast its electoral votes for the Republican candidates.

In his inaugural address, President Harding indicated that one of the main aims of his administration was to secure a return to "normalcy." To help achieve this process, he called Congress in special session in April 1921, and a number of important measures were passed, including the adoption of a national budget



WARREN G. HARDING

system, the passage of a joint resolution declaring the war with Germany and Austria at an end, and the enactment of acts revising the tariff and further limiting immigration. The immigration act provided that the number of aliens who could in any one year enter the United States should not exceed three per cent of the persons of that nationality resident in this country in 1910 (*see* Immigration). The tariff act was a temporary measure, and it was superseded in 1922 by the Fordney-McCumber Act, which provided the highest duties in United States history.

Foreign Policies

In foreign affairs, President Harding's policy was to keep the United States from becoming involved in European politics. During the campaign his position on the League of Nations issue had been equivocal, but after his inauguration he made it clear that he was definitely opposed to entering the League. The administration withdrew the American unofficial representatives on the Reparation Commission and refused to have any formal part in League deliberations. American troops in Germany were gradually withdrawn, and in January 1923 the last of them were ordered home.

President Harding did not, however, share the views of those who favored complete American isolation. He repeatedly expressed his desire to strengthen the bonds of friendship between nations and to promote peace. He urged American participation in the Permanent Court of International Justice at The Hague, and called an international conference to meet at Washington in November 1921 to consider naval reduction and certain Pacific and Far Eastern questions. The principal naval powers invited were Great Britain, France, Italy, and Japan. Invitations were also sent to China, and to certain smaller European powers such as Belgium, Portugal, and the Netherlands, who had interests in the Far East.

The idea of the Washington Conference was received with manifest enthusiasm, and nations were represented by eminent statesmen, notably Balfour of England, and Briand of France. President Harding himself welcomed the delegates, but the actual course which the United States took was directed by Secretary of State Charles E. Hughes. With a boldness seldom seen in a diplomatic meeting, he proposed that there should be a naval holiday for ten years. His plan stipulated that a large number of ships in the navies of the United States, Great Britain, and Japan should be scrapped, and that the ratio in power

in capital ships between these nations should be 5-5-3 respectively. Differences of opinion naturally developed but certain agreements were finally reached.

Results of the Washington Conference

This conference was the most conspicuous achievement of President Harding's foreign policy. It resulted in an agreement between the United States, Great Britain, and Japan accepting the naval holiday plan and the 5-5-3 ratio, and providing for the scrapping of over threescore vessels. Italy and France also agreed to limit their capital ships to a strength about one-third that of the United States and Great Britain. Restrictions were imposed upon the use of submarines, and the use of poison gas in warfare was forbidden.

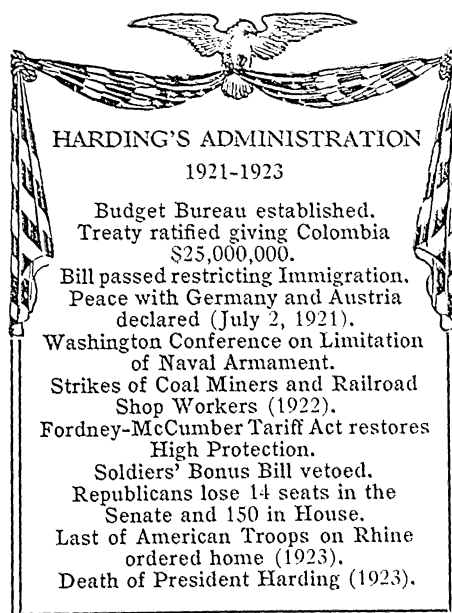
Another treaty between the United States, Great Britain, France, and Japan, bound them to protect one another's rights to their insular possessions in the Pacific and in cases of disagreement that could not be settled by diplomacy to submit the dispute to a conference. Two more treaties between these powers including Belgium, China, the Netherlands, and Portugal, provided for the maintenance of China's territorial integrity and sovereignty, and the principle of the "open door." Japan also agreed to withdraw from Shantung. No agreement was reached regarding cruisers and other subordinate naval craft, and this later resulted in a serious diplomatic controversy.

During the war prices had risen to unprecedented levels, and an orgy of speculation soon followed the armistice.

Money was obtainable at easy rates, and people failed to realize that with a large part of the world impoverished by strife, the seeming prosperity of the United States could not last. Land prices in various parts of the country, especially in the middle west and northwest, were doubled, tripled, even quadrupled, and speculation was rampant in many industries. Before the end of 1920 the inevitable deflation began, bringing hard times and financial ruin to millions.

The Farmers' Problems

Clamorous demands for government relief were raised, especially by the "farm bloc," an informal non-partisan organization of congressmen especially interested in the problems facing agriculture. A number of measures designed to aid agricultural interests was passed, but none was very helpful. By 1923, business was more normal but the farming conditions continued unstable and various remedies were proposed. A number of things combined to make the farming situation acute. One of these was the substi-



tution of motor power for horse power on the farms. The number of horses and mules used on the farms decreased by the million, and tens of millions of acres of land that would have been required to raise and feed such animals were used for other purposes. The expansion of the production of wheat, cotton, and foodstuffs, stimulated by the high prices and the great demand from Europe during the World War, now produced a surplus on the world market. The farmers were reluctant to reduce their acreage. The result was a fall in the price of farm products and lands.

The effects of hard times and the usual backward swing of the political pendulum were evident in the congressional elections of 1922. The Republican majority in the Senate was cut from 24 to 10, and in the House from 165 to 15.

President Harding's cabinet contained Charles Evans Hughes, Herbert Hoover, and other men of great ability and integrity. Unfortunately some members of the Cabinet were not so admirable. Early in the administration, the President approved the transfer of certain government oil lands at Elk Hills in California and Teapot Dome in Wyoming from the Navy Department to the Department of the Interior. These oil lands were then leased to the Doheny and Sinclair interests. There was nothing essentially dishonest in such a transaction, though the leasing of such lands was opposed by conservationists. Later, however, it was revealed that after granting these leases, Albert B. Fall, secretary of the interior, received large sums of money under the pretense of "loans." The disclosure of these and other facts aroused popular indignation. In the meantime, Fall had resigned from the Cabinet and was therefore beyond the power of impeachment. However, he was later prosecuted and after long delays ultimately convicted for his part in the affair. Doheny and Sinclair were also brought to trial but escaped conviction, though Sinclair served a jail term for contempt of the Senate. Cancellation suits were also brought—on the ground that the leases had been obtained by fraud—and won, the oil lands being restored.

Public distrust also fell upon Attorney-General Harry M. Daugherty because of his share in transferring the oil leases and because of certain other activities. The accusations against him were felt to be the more serious because he was a close friend of the President and had managed his campaign. After the death of President Harding, and at the demand of President Coolidge, Daugherty resigned. He was tried for conspiracy with the alien property custodian, but the jury disagreed, and the case was dismissed.

President Harding was spared the humiliation of most of these revelations. In June 1923, with his wife and a large party, he set out on a tour of the West and Alaska. On his return to Seattle he was taken ill. He was removed to San Francisco and while apparently recovering, he died of an apoplectic stroke on the evening of August 2. His body was taken to Washington for the state funeral, and afterwards to a

mausoleum at Marion, Ohio. President Hoover, upon the dedication of the Harding tomb in 1931 said: "Warren Harding had a dim realization that he had been betrayed by a few of the men whom he had trusted, by men whom he had believed were his devoted friends. It was later proved in the courts of the land that these men had betrayed not alone the friendship and trust of their stanch and loyal friend, but they had betrayed their country. That was the tragedy of the life of Warren Harding."

Harding was not a great president, though under him the difficult period of reconstruction was successfully passed, the national budget was balanced, the national debt reduced, and a return to something approaching "normalcy" effected. He himself made no claims to greatness; he said that if he possessed any particularly useful quality it was that of helping people to "march in step."

HARDY, THOMAS (1840–1928). Although the books of this great tragic novelist are too gloomy and pessimistic to be "popular," he is one of the few writers whose works have been accepted as classics in their own lifetime. Born near Dorchester in Dorsetshire, England, he passed most of his long life, as did his ancestors before him, in that region of woodland and heath and moor which he calls by its old name "Wessex" and which forms the setting of most of his writings. He was educated at local schools and by private tutors and for a time studied at King's College in London. At 16 he began the study of architecture and at 22 went to London as assistant to an architect. He had already begun to write and for a time was uncertain whether to make architecture or letters his profession, but after his first really successful novel, 'Far from the Madding Crowd', was published in 1874, he decided to retire to Dorsetshire and devote himself to literary work. Doubtless architecture had much to do with his wonderful constructive power.

Hardy was interested in the simple primitive men of the countryside with their strong elemental instincts and passions. Still more was he concerned with nature in all its moods and changes, not only as the great background against which man moves onward to his destiny, but as a power entering the very life of man, sometimes sympathetic, more often cruel.

What Meredith called his "twilight view of life" gives to most of his work an atmosphere of melancholy and pessimism. Though it is thoroughly modern in the realism with which it depicts common life, even in its ugly and sordid aspects, it is like that of the old Greek dramatists in presenting the innocent or helpless as victims of relentless fate. This makes Hardy's 'Tess of the D'Urbervilles' one of the most terrible as well as one of the most artistic of all novels.

Hardy's chief novels are: 'Under the Greenwood Tree' (1872); 'Far from the Madding Crowd' (1874); 'The Return of the Native' (1878); 'Tess of the D'Urbervilles' (1891); 'Jude the Obscure' (1895); 'The Well-Beloved' (1897); 'A Changed Man' (1913). His poetry includes 'Wessex Poems' (1898) and 'Time's Laughing-stocks' (1909). 'The Dynasts' (1903–1908) is an epic drama in three parts.

The WILD RABBIT and His RELATIVES



HARES AND RABBITS. Do you know the difference between a hare and a rabbit? If you do, you know more about these animals than a great many people. In America all members of the family to which hares and rabbits belong—and it is said there are more than 60 species—are often called “rabbits,” but most are hares. Wild rabbits are smaller and have shorter ears and shorter hind legs than the hares. They usually live in burrows and their young are born blind and nearly naked. Hares do not burrow and their young are covered with fur at birth and have their eyes open. The hind legs of hares are longer than their fore legs; this gives them an awkward appearance but enables them to run faster up hill than down. Rabbits breed five or six times a year; hares two or three times. There are from four to six young in a litter of either variety. Young rabbits breed when they are about six months old, but they do not attain their full growth until they are a year old.

Hares and rabbits are rodents, or gnawing animals, but unlike any other rodents they possess two small incisors, or cutting teeth, behind the large ones in the upper jaw. Scientists believe that these teeth are remnants of two additional incisors possessed by their ancestors, and possibly by other rodents, many years ago (*see Evolution*). Their upper lips are cleft and that is why a deformity of the upper lip in human beings is called “hare-lip.” Their tails are short and stand erect. They have five toes on the fore feet and four on the hind feet. They are mostly nocturnal in their habits, that is, they usually remain “at home”—the rabbits in their burrows, and the hares in their “forms,” as their nests are called—during the day, and go out to feed at night. They feed upon vegetables, grass, leaves, buds, berries, and the bark of trees and shrubs. They are fond of clover, cab-

bage, dandelion leaves, and carrots, and sometimes do much damage to gardens.

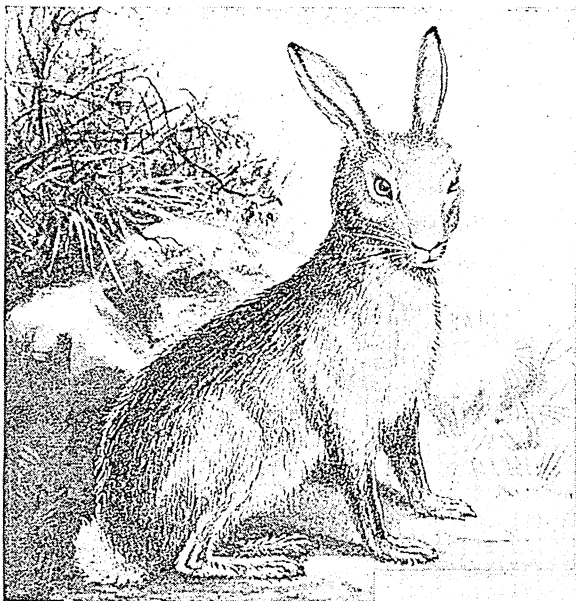
Hares and rabbits are timid but they fight bravely in defense of their young, and in self-defense. They are capable of striking powerful blows with their hind feet and have been seen to knock over a weasel and kill a snake. Domesticated rabbits generally live peacefully with cats, but when differences arise the rabbit usually succeeds in making the fur, as well as the cat, fly. In avoiding their enemies they display much ingenuity and some observers give them credit for being as clever as foxes. When pursued they have a habit of stopping suddenly, almost under the feet of their enemy, and turning with incredible swiftness to run in another direction.

How the Hare Gets His Speed

Their tremendous speed is due to their peculiar method of running, to which the structure of their legs is eminently fitted. When the hare or rabbit takes to flight he leaves the ground with a tremendous leap and for an instant is completely extended. While in the air, however, he brings his hind legs forward until they project beyond and above his head. While bunched in this position, his fore paws strike the ground, one ahead of the other. His momentum tilts him forward, and at the same time he starts swinging his hind legs downward. They strike the ground side by side, but at a spot far ahead of where the front feet are planted. Doubled up thus like a spring, the rabbit “uncoils” suddenly in his next great leap. This method of running is the cause of the peculiar appearance of rabbit tracks familiar to all hunters. They form a pattern like a human face, the marks of the hind paws corresponding to the eyes, and of the fore paws to the nose and mouth. Measurement of these tracks shows that a frightened jack-rabbit covers 15 to 20 feet at a bound.

By man these animals are persistently hunted for their tender and wholesome flesh, and for their fur, which is used to make felt hats. In addition to man, all the beasts and birds of prey are their natural enemies. They are the constant food of wolves, coyotes, lynxes, foxes, mountain lions, and wild cats, and are preyed upon more or less by badgers, skunks, minks, weasels, owls, and hawks. Yet, despite all

A "TURNCOAT" AMONG HARES



their foes, they increase so rapidly that they sometimes overrun large areas and destroy entire crops. In 1850 three pairs of the European rabbit were turned loose in Australia and within a few years it became a question whether their descendants could be controlled before they swept the country clean. Millions of dollars were spent for bounties and for devices for killing the rabbits or protecting the crops. Many professional rabbiters are employed to exterminate them. New Zealand had a similar experience a few years later (see Australia).

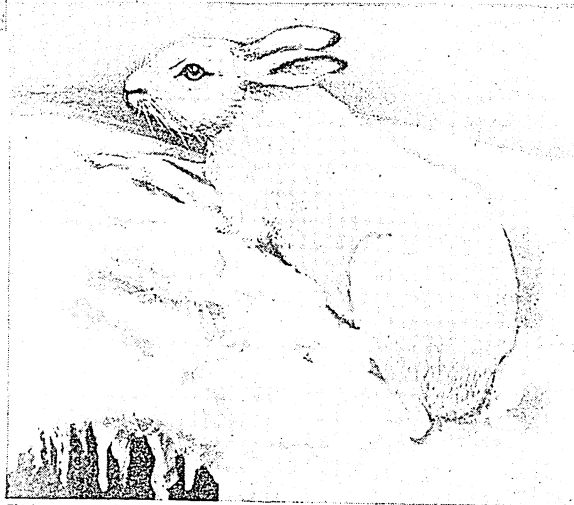
Hares and rabbits belong to the family *Leporidae*. A common and familiar American member of this family is the little gray rabbit, or cotton-tail. It is a rabbit, although it does not burrow to the extent indulged in by its European brother, and its young are frequently born in nests, or forms, above ground. The mother cotton-tail generally lines the nest, or covers her naked young ones, with fur from her own body.

The total length of the cotton-tail is 17 inches; its general color is cinnamon brown, grayer behind. It is white underneath with a gray stripe across the breast. The under surface of the tail is pure white. Cotton-tails, of which there are more than 20 varieties, abound over almost the whole United States.

"Molly Cotton-tail" has an interesting habit of crouching in her resting place and remaining motionless when an enemy approaches. She crouches lower and lower and often escapes detection because her color blends perfectly with her surroundings. She remains perfectly still except for the twitching of her nose and upper lip until her enemy is almost upon her, then—zip! a gray flash! She is off and all that can be seen is a white streak—her tail—which looks like a ball of cotton flying through the underbrush. In an instant she is out of sight. Molly lives alone—rarely are two cotton-tails seen together—and she is always alert. Her hearing and sense of smell are very acute. She is wise, too, and prefers to make her burrow under a tree, with the entrance between the roots, so that her enemies cannot dig her out.

The Rabbit that Breaks the Running Record

The jack-rabbits are the largest and best-known of the American hares. They are more than two feet in length and their ears are five or six inches long. They have slender bodies and long legs, which enable them to run at a tremendous pace for short distances, as many a dog has discovered to his distress. Black-tailed jack-rabbits are common on the open plains of



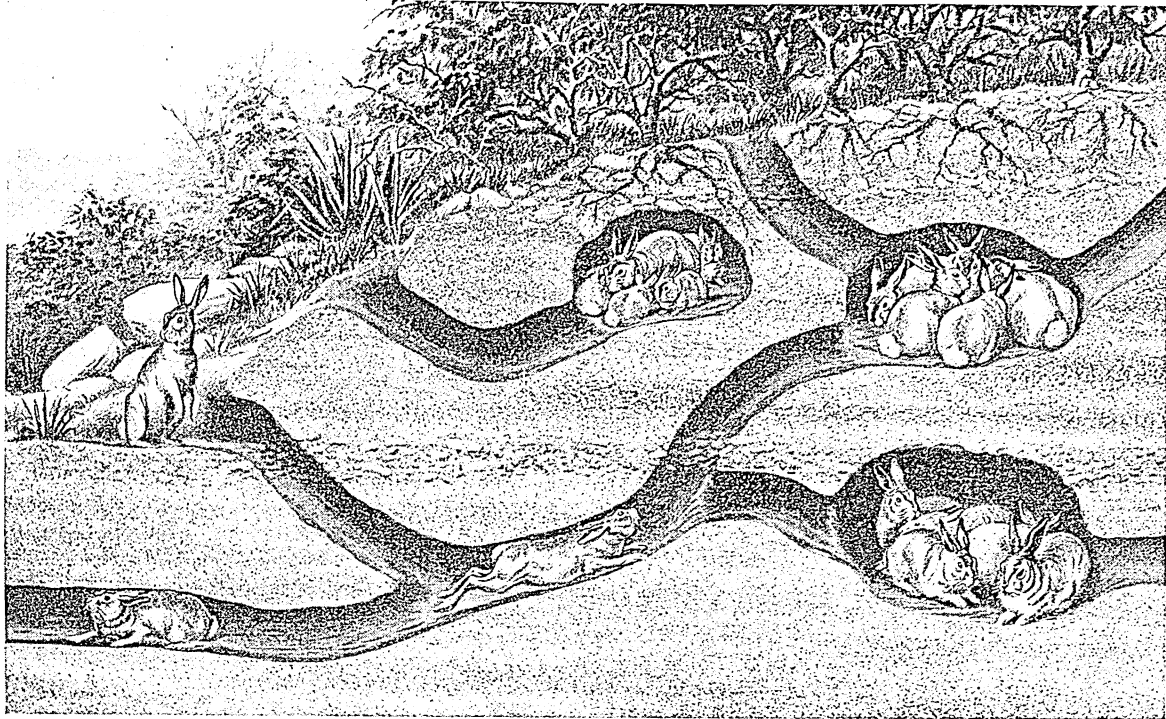
This is the Alpine Hare, in his summer dress above, and in his winter dress. This long-eared fellow is found in Scandinavia and northern Russia. Scientists believe he is closely related to the American Arctic Hare, which he resembles. The change to white in winter helps to make him invisible to his many enemies against the background of snow.

the western states, southward to central Mexico and northward to Saskatchewan. Jack-rabbits increase rapidly and frequently cause much damage to crops. At such times thousands are killed by poisoning and by organized drives in which whole communities participate. The white-tailed jack-rabbit, or prairie hare, frequents the western plains and the high mountains of the Rockies and Sierra Nevadas. This hare

changes its grayish-brown coat for a white pelt in winter.

The varying hare, or snowshoe rabbit, another large hare, ranges from the northern part of the United States and Canada to the Arctic Circle. It is called a varying hare because it sheds its hair twice a year, changing color each time, becoming white in the fall and brownish in spring. It is also called

UNDERGROUND LIFE IN A EUROPEAN "RABBIT TOWN"



European rabbits are sociable creatures. They form colonies in burrows called "warrens." Most of the passages are connected together, with little side "pockets" in which individual families dwell. Mother rabbits, however, usually have separate burrows, as you see in the upper part of the picture, until the little ones are well grown. The main warren always has two or more entrances, so that if enemies such as weasels and ferrets come in one door, the inhabitants can run out through another. Usually the entrances are made behind the concealing protection of a bush or rock.

the snowshoe rabbit because in winter its large hind feet are covered with a thick growth of hair which enables it to travel easily over deep snow.

The Arctic hare lives in the far north. In the northern part of its range it retains its heavy white coat throughout the whole year, but in its southern limits it becomes grayish in the spring. Like the snowshoe rabbit, this hare wears snowshoes in winter—that is, its hind feet are heavily padded with fur.

The only rabbits in the world known to be aquatic are the swamp and marsh rabbits of America, which live in the southern United States. These rabbits take to water as readily as muskrats.

The common hare inhabits all parts of Europe except Ireland, Scandinavia, and northern Russia. It is 20 to 22 inches long and weighs 6 to 8 pounds. The Alpine hare, also called the blue or mountain hare, resembles the Arctic hare of America. It is found in Scandinavia and northern Russia. A related species, *Lepus hibernicus*, is found in Ireland.

The European Cony and Other Varieties

The European rabbit or cony differs from the American gray rabbit in many respects. It lives in colonies in burrows called warrens, and in the wild state it is said to mate for life. It feeds at dusk in the morning and evening, and remains in its burrow during the day. This is the species that was introduced into Australia and New Zealand and overran those countries. It is also the ancestor of most of

the domestic varieties, many of which have outstripped it in size.

All of the domestic varieties, including the Belgian hares, are rabbits. The Belgian is well known in America, where it is widely bred. It weighs about 10 pounds. The Patagonian is the largest, weighing from 12 to 16 pounds. The lop-eared rabbit is larger than the Belgian and is remarkable for its ears, which lop, or hang down, and are from 10 to 12 inches long and 6 inches wide. The Angora is noted for its long, silky fur. Other domestic breeds are the Polish, Flemish, Himalayan, Dutch, Siberian, and silvertip. Snow-white rabbits with pink eyes, called albinos, are favorite pets. They are pretty, easily kept, and become very fond of their keepers.

Among tumbling rock slides, high in the mountains of Europe, Asia, and western North America, lives the pika, a queer rabbit-like rodent. This animal, with its short legs, small rounded ears, and stumpy tail, looks much like a small guinea-pig. Pikas believe in making hay while the sun shines, for all summer long they are busy piling up great stacks of dried grasses to feed them during the long winter months.

Scientific name of cotton-tail rabbit, *Sylvilagus floridanus*; of black-tailed jack-rabbit, *Lepus californicus*; of prairie hare, *Lepus townsendii*; of varying hare, *Lepus americanus*; of Arctic hare, *Lepus arcticus*; of marsh rabbit, *Sylvilagus palustris*; of swamp rabbit, *Sylvilagus aquaticus*; of European common hare, *Lepus europaeus*; of Alpine hare, *Lepus timidus*; of European rabbit, *Oryctolagus cuniculus*.

HARGREAVES, JAMES (1730?-1778). The obscurity of this inventor contrasts sharply with the world-wide importance of his invention, the spinning jenny. Almost nothing is known of his life. He was born probably at Stanhill in Lancashire. Then, as now, Lancashire was the center of England's manufacture of cotton goods, but the industry was still confined merely to workmen's homes, and the cards, spinning wheels, and looms were operated by hand. Here he became a skilled carpenter and spinner, and made an ingenious carding machine for a neighbor.

The story goes that an accident gave Hargreaves the idea for his spinning jenny. In his crowded cottage, which was both home and workshop, he had been experimenting with spinning two threads at once, with the wheel upright and the two spindles held horizontally. But the threads were in too close contact, and constantly became tangled. Then one of his children upset the wheel so that the spindles were vertical and the threads flew apart as wide as the wheel's diameter. Hargreaves seized the idea and set the spindles ver-

tically in a frame. This invention, made sometime between 1764 and 1767, enabled him to spin eight threads at once. He called it a spinning jenny, some say in honor of his wife and others of his daughter.

The amount of cotton yarn he began to turn out alarmed his rivals, who feared that his wizard machine would leave nothing for them to do; so they broke into his home and destroyed his jenny. He moved to the large town of Nottingham, where he set up a fairly profitable yarn mill and in 1770 patented the spinning jenny. As he had previously sold several of his machines, the patent was declared void when brought to a test. This left others free to seize upon his invention without paying him royalties. Consequently, it came into wide use. The production of cotton yarn was increased vastly, for even during his lifetime jennies were built to spin as many as 80 threads at once.

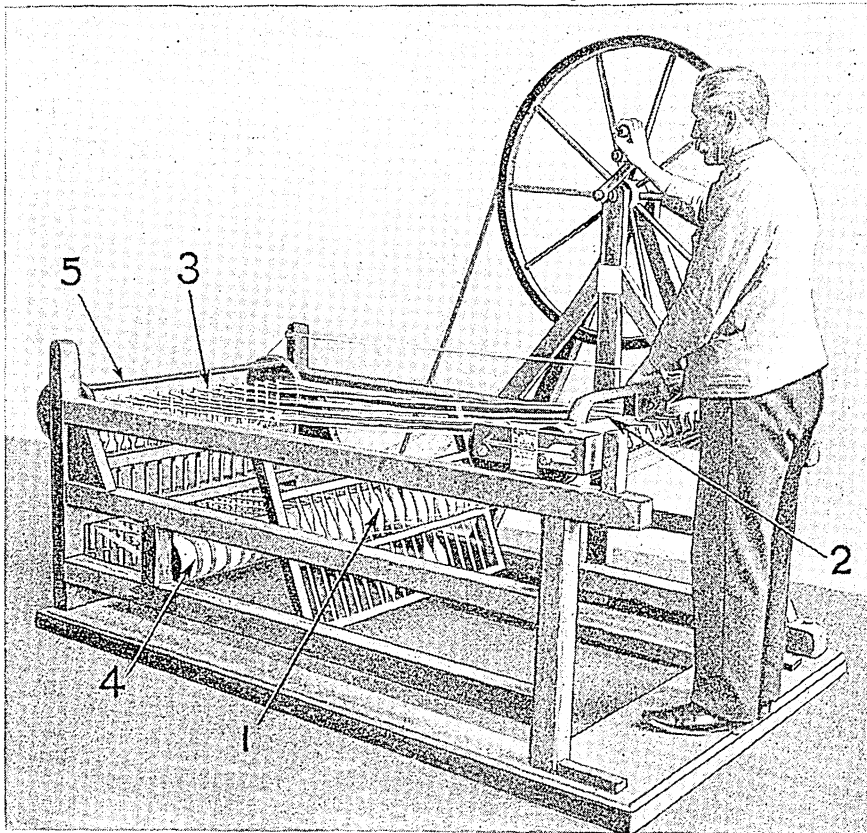
Other inventors were also at work in solving the same problem, and before Hargreaves' death, in 1778, mechanical spinning was fully developed by Richard

Arkwright and Samuel Crompton. The stories of these two inventors, told in separate articles in this work, are sequels to this sketch of James Hargreaves, as is also that of Edmund Cartwright, the inventor of the power loom.

HARMONICA. Every boy and girl, no doubt, has tried to play a harmonica, though many of them may know it better as the "mouth organ" or "French harp." This simple instrument, which for many years was considered only a child's toy, has proved very useful and popular in the elementary schools since instrumental music has found a place in progressive school programs. The harmonica is inexpensive and children can learn to play it with very little musical instruction. They therefore show great interest in organizing harmonica bands, which have proved an excellent device for arousing an interest in music.

Two persons who have gained notice in the United States as organizers of

HARGREAVES' SPINNING JENNY



This is the first machine to spin several threads at the same time. The rovings of loosely twisted yarn are wound on bobbins (1) which you see in the center of the frame. From the bobbins the rovings pass through a movable clasp (2), which the operator pushes to and fro with his left hand. From the clasp they extend across the top of the frame to the spindles (3) placed at the other end. When the rovings have been attached to the spindles, the operator turns the large wheel with his right hand. A belt from the wheel turns a cylinder (4), and the smaller belts carry the power to the bottoms of the spindles. As the spindles revolve, the yarn slips off their tops and is spun and stretched into thread, while the clasp is being pulled from near the center of the frame toward the operator to draw the threads out. When the threads have received the proper twist, the operator pulls the wire you see at the right-hand side of the frame. This pulls a bar (5) down over the threads so that they are now wound on the spindles instead of slipping over the tops, while the clasp is being pushed toward the center of the frame.

boys' harmonica bands are Albert N. Hoxie and Borrah Minevitch. Hoxie organized the first one in Philadelphia in 1921 "for the purpose of interesting boys in the better things of life by attracting them with the harmonica." Several boys from his band have become members of the Philadelphia Symphony Orchestra.

Borrah Minevitch, a Russian, who about the year 1917 was known in Boston as the "harmonica-playing newsboy," has also led boys to music through the harmonica. He became a leading attraction at theaters as a solo player and later began to interest boys in his art. He finally organized the Harmonica Institute of America, with headquarters in Rockefeller Center, New York City, where harmonica fundamentals and the rudiments of band harmony are taught in four lessons.

The harmonica is a wind instrument. The notes are produced by tiny strips of metal which fit into holes in metal plates fastened to each side of a strip of wood. The strips are left free at one end so that they vibrate when the player blows into the instrument or sucks in his breath. Strips of different length produce the different notes.

Another musical instrument, invented in the 17th century and improved by Benjamin Franklin, was also called a harmonica. Franklin's harmonica consisted of a number of glass bowls, each tuned to a note and fastened on a long spindle, which was made to revolve by working a treadle. The sound was produced by running the finger around the rims of the glasses. Playing on the glasses became at one time a very fashionable accomplishment and music for the instrument was written by Mozart, Beethoven, and other composers.

HAROLD, KINGS OF ENGLAND. Only two kings of England have borne the name Harold, and both of them reigned before the Norman Conquest.

HAROLD I (died 1040). The first Harold, called Harefoot, was the son of the famous Danish monarch, Canute, who ruled Denmark and Norway as well as England. When Canute died in 1035 Harold claimed the English crown in opposition to his half-brother, Hardicanute. Both claimants had powerful supporters, but finally, in 1037, Harold was elected by the assembly. His short reign was uneventful except for minor invasions of the Welsh and Scots.

HAROLD II (1022?-1066). The reign of the ill-starred Harold II, the last king of the Anglo-Saxon period, lasted less than nine months. He was crowned upon the death of Edward the Confessor, in January 1066, and lost his life in October, when the Norman William the Conqueror defeated his troops in the famous battle of Hastings. Ever since that day—except during the days of Cromwell—the English throne has been held by descendants of the Norman conqueror.

For several years before the death of Edward, Harold had been the chief man in the kingdom, and when Edward died without direct heirs, Harold was

chosen by the assembly of nobles to succeed to the throne. William, Duke of Normandy, laid claim to the English kingship on the strength of a promise made by Edward that the crown should descend to him, and because of an oath sworn by Harold to aid him. When William invaded England to make good his claim, Harold was in the north, where he had been called to repel an attack by the Danes. Hastening south with his troops, Harold met the Norman invaders, only to fall on the field, surrounded by the corpses of the bravest men of England. (*See* Edward, Kings of England; Hastings, Battle of; William, Kings of England.)

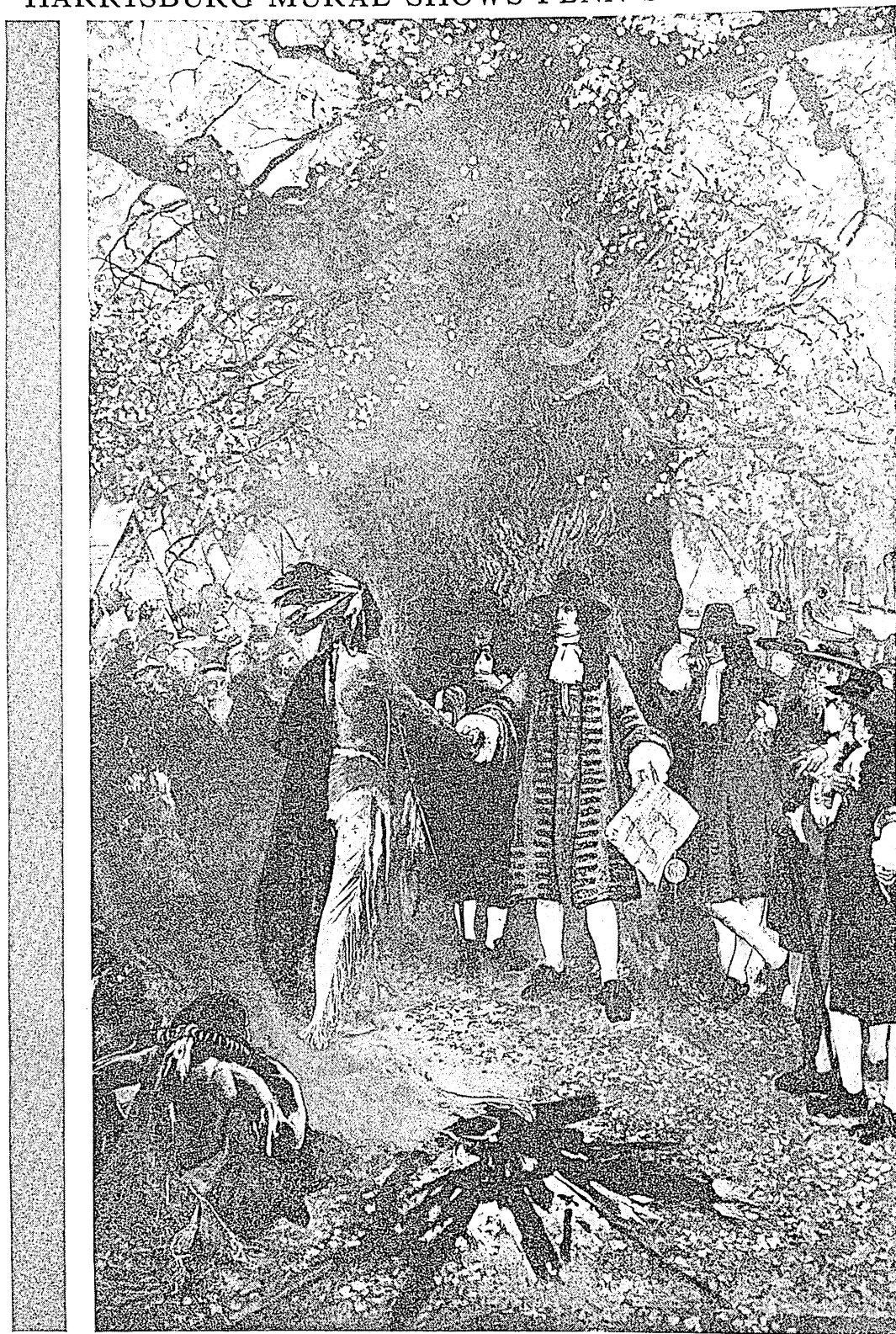
HARP. The harp is the most ancient of stringed instruments. From primitive times men knew that a stretched bowstring gave out a pleasing twanging sound when it was plucked. It is easy to see how some musically inclined genius conceived the idea of adding other strings of different lengths, thus producing an instrument on which simple melodies and chords could be produced. Greek legend tells how the cithara or lyre, a harplike instrument, was invented by the precocious god Hermes (Mercury), who put strings across a tortoise shell a few hours after his birth and made sweet music. The great antiquity of the harp is also indicated by Egyptian paintings, thousands of years old, which picture the harp in various stages of development, from a form obviously derived from the hunter's bow to elaborately carved triangular instruments much like the beautiful harp of modern days. Some of these early Egyptian harps, dating from about 1500 years before Christ, are still to be seen in the British Museum. Much like these were the harps used by the ancient Hebrews in their religious ceremonies and by the ancient Irish people.

In the modern harp the strings are stretched between the sounding board, which rests against the player, and a gracefully curved bracket connecting the top of the sounding board with an upright pillar. Through this pillar pass rods, worked by pedals at the base of the harp, by means of which the pitch of the strings is changed so that the harp can be used in any key.

If a pedal is pressed half-way down, the note is raised a semi-tone; if pressed fully down, it is raised a tone. At one side of the grooves in which the pedals work in the pedestal of the harp are two notches into which they can be hitched when required. So you see that three different tones can be produced on every one of the about 46 strings, giving the harp a very wide range.

These ingenious double-action pedals—of which there are seven—were invented by Sebastien Erard (1752-1831), a French manufacturer of musical instruments, who was also distinguished for his improvements upon the pianoforte. By perfecting the harp in this and other respects, Erard greatly amplified its possibilities for orchestral use, so that now the great scores of Meyerbeer and Gounod, of Berlioz, Liszt, and Wagner are not complete without it.

HARRISBURG MURAL SHOWS PENN'S FAMOUS TREATY



The gentle and just Quaker ways of William Penn triumphed on June 23, 1683, when he made his famous treaty with the Indians at Shackamaxon, now Kensington, under an elm on the banks of the Delaware. "The only treaty never sworn to, and never broken," Voltaire called it. The mural above, by Edwin A. Abbey, decorates the state capitol building at Harrisburg, Pa., and shows the promise "to live in love as long as the sun gave light."

The harp is one of the most difficult of instruments to play and skilful harpists are very rare. But to be able to waken its beautiful tones must well repay long hours of patient study, for its voice is unlike that of any other instrument.

HARPIES. In ancient mythology the harpies were conceived as repulsive creatures—birds with the faces of old women, the ears of bears, and crooked talons. One legend relates how Phineus, king of Salmydessus, in Thrace, deprived of his sight by the gods for his ill-treatment of his sons, or for revealing the future to mortals, was condemned to be tormented by two harpies who snatched away whatever food was placed before him and devoured it. In Homer their function is to carry off to the underworld or to some spot beyond human ken those whose sudden disappearance is desired by the gods. The name harpies means "the robbers" and they are supposed to be a personification of the storm winds.

HARRISBURG, PA. In the eyes of strangers, the sumptuous state capitol building, with its fine bronze doors, its sculptures by George Grey Barnard, its mural decorations by Edwin A. Abbey, John W. Alexander, Violet Oakley, and other noted painters, and its decorative tiles and stained glass, is Harrisburg's greatest point of interest. It is one of the finest statehouses in America, on which was spent the huge sum of \$13,000,000. But to the citizen of

Harrisburg the city's chief pride is not this notable and beautiful building, but the remarkable civic improvements which have given it the name of "Model City."

At the beginning of the 20th century Harrisburg was a prosperous but dirty manufacturing town, supremely ugly and sublimely content. Did not its railroad roundhouses and repair shops, its car works, machine, boiler, and shoe factories, its lumber, tin, and rolling mills, its nail works, typewriter factories, and blast furnaces, bring in ever more money? Why worry about trifles like dirty streets, lack of playgrounds, impure drinking water, and typhoid rates?

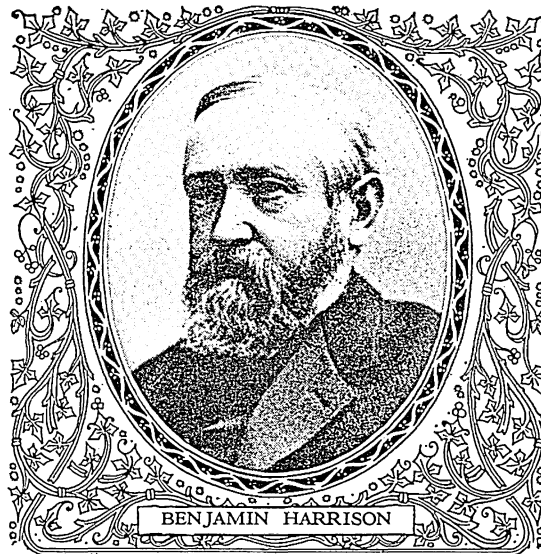
Then in 1900 the city underwent a change of heart, and in 12 years' time an outward change as well. By a concerted movement of all its citizens, pure filtered water was secured, scores of miles of streets were paved, and a splendid chain of parks and playgrounds was acquired—in short, Harrisburg became a city worthy of its beautiful situation in south central Pennsylvania on the broad Susquehanna River, with the Blue Ridge Mountains about ten miles away. The city is built on the site of an Indian village and is named after John Harris, who settled there in 1705 and established a trading post. The city was founded in 1785 and became the state capital in 1812. It has had the commission form of government since 1913. Population (1940 census), 83,893.

PRESIDENT and Grandson of a PRESIDENT

Descendant of a Family of Patriots—The 23d Occupant of the White House

HARRISON, BENJAMIN (1833-1901). "And grandfather's hat fits Ben," was the refrain of one of the popular election songs of 1888, when Gen. Benjamin Harrison of Indiana was elected president. The grandfather was William Henry Harrison, hero of Tippecanoe, and president in 1841. The grandson, Benjamin, was a brigadier-general of the Civil War, who became one of the ablest lawyers of Indiana, and had been senator from that state, 1881-87.

There was something of a mystery in the fact that Benjamin Harrison was, for any reason at all, elected president of the United States. He was not a "hand-shaking" politician, and had never been active as a party worker. When he stood on a platform and addressed a public audience, he was one of the clearest and soundest speakers of his day. The audience forgot that he was short and



unimpressive, with a large head resting immediately upon his shoulders. They forgot that disrespectful reporters called him a "pouter pigeon." They went away believing him to be a statesman. But when he sat at a desk and dealt with men as individuals, his cold manner and seeming indifference often turned them against him. Even when he granted men favors, they went away dissatisfied. Yet no man ever had more loyal or devoted friends.

Election of 1888

Harrison was nominated by the Republicans in 1888, because the nominating con-

vention was deadlocked by the attitude of James G. Blaine, who was the real leader of the party. Blaine, the nominee of 1884, had been beaten by Grover Cleveland, and was unwilling to run again. His friends stood out long, hoping that he would reconsider. When they had to give him up they demanded

a man who had few political enemies, whose private life was above any suspicion of reproach, and who could be expected to carry the doubtful states of Indiana and Ohio. Harrison met these tests. His family went back to Benjamin Harrison, from Virginia, who had signed the Declaration of Independence. William Henry Harrison, long governor of Indian Territory and Indian fighter, had been elected president in the thrilling campaign of 1840. The name was well known.

Benjamin Harrison, with this family background, had lived a useful life. Educated in a log schoolhouse at North Bend, Ohio, and at Miami University (1852), he practised law in Indianapolis before he went to war in July 1862 as a second lieutenant. He served ably in Kentucky and Tennessee, took part in the march on Atlanta, and left the service as brigadier-general, promoted for "ability and manifest energy and gallantry."

The election of 1888 turned sharply on the tariff issue, which had been rising in prominence since the campaign of 1880 (*see* Tariff). For years the Democrats had argued that a protective tariff was only a form of favoritism to a wealthy and sectional class, and President Cleveland had demanded a tariff for revenue only. The Republicans, on the other hand, insisted that prosperity in the United States depended upon the economic independence that came from a protected system of manufactures. They carried the election in 1888, in spite of lukewarm interest in the Republican states of the West, where the voters thought the government protected the rich in the East and gave little thought to the farmers, and in spite of demands from workingmen that something ought to be done to ease their life and protect them in the uneven competition between the trusts and the workers.

Harrison was elected, and with him Levi P. Morton of New York as vice-president. Harrison won the majority of the electoral college (233 out of 401), but received fewer popular votes than did Cleveland, the Democratic candidate. The Republicans also carried both the Senate and the House, and were able in the next (the 51st) Congress to pass

any party measures upon which they could agree. This was the Congress in which Speaker Thomas B. Reed won the title of "czar" because of his stern rulings to increase the efficiency of the House and to frustrate minority opposition.

The President soon discovered how difficult it was to perform his duties when he was not the real leader of his party. He chose the real leader, Blaine, to be secretary of state; and the latter resumed with enthusiasm the tasks he had started eight years before under Garfield. The others in the cabinet were men of minor political importance. One, in the newest seat, was Jeremiah Rusk of Wisconsin, thrice governor there and always known as "Uncle Jerry," who was secretary of agriculture. Another was John Wanamaker of Philadelphia, head of a great department store and superintendent of a Sunday school, whose presence in politics and whose business were both good illustrations of the times.

Business Changes

John Wanamaker, as treasurer of the Republican campaign committee, had raised money, perhaps \$400,000, for the campaign fund, by persuading his manufacturing friends that if the Democrats won the election they would reduce the tariff, and the manufacturers would lose their profits. Senator Matthew S. Quay, who managed the campaign, asked to have him made post-

master-general as a reward. This was done, and the Postoffice Department was the better for having a chief who was accustomed to big business transactions. Wanamaker did not please the civil service reformers, but he helped to launch rural free delivery, which made life more comfortable for farmers in remote places. He also worked hard in favor of postal savings banks and parcel post, which came later.

Wanamaker was best known as a storekeeper. He, Marshall Field of Chicago, and Alexander T. Stewart of New York had devised and applied changes in retail trade that produced the modern department store. Among them they broke down the old motto of *caveat emptor* ("let the buyer beware") which had always prevailed in business, and introduced the new practise of "money refunded," which has now become general. They gave a guarantee that their goods were

ADMINISTRATION OF BENJAMIN HARRISON 1889-1893

James G. Blaine, Secretary
of State.

"Reed rules" adopted in the
House (1890).

McKinley Tariff Act, Sherman
Anti-Trust Act, Sherman Silver
Purchase and Coinage
Act passed (1890).

Pension expenditures greatly
increased.

North Dakota, South Dakota,
Montana, Washington, Wyoming,
and Idaho admitted as states
(1889-90).

Territory of Oklahoma opened to
settlement (1889).

First Pan-American Conference
held in Washington (1889-90).

Bering Sea controversy with Great
Britain settled (1893).

Controversies with Italy (Mafia
troubles), with Germany (over
Samoa), and with Chile.

Reciprocity treaties with Spain
and Brazil.

Annexation of Hawaii fails.

People's Party (Populists) organized
(1891).

Harrison defeated by Cleveland
for reelection (1892).

as represented. They adopted the principle of the "fixed price" with the price plainly marked on every article, and did away with the barter that had made shopping a risky sport for buyers. They also gathered under one roof a multitude of different shops, each a department in a great store, instead of being a separate specialty shop; and by wholesale buying cut down their costs.

These men made huge fortunes for themselves, their millions bulking large beside the estates of the bankers, the railroad magnates, and the manufacturers. They could not have grown and flourished except in the

Harrison and Wanamaker were in office, the Astor family, which had built a palace on Fifth Avenue, New York, only a few years earlier, tore down the home and erected in its place the Astoria Hotel. Soon this became the Waldorf-Astoria, and for a generation, until it was replaced with the 102 stories of the Empire State Building in 1931, it remained the most celebrated hotel in the United States.

The Fifty-first Congress

In the 51st Congress there was much work to be done, for there had not been a government under the complete control of one party for many years. First

THE THIRD AVENUE ELEVATED STATION AT 67TH STREET IN 1890



The development of rapid transit in large cities during the 1890's built up huge fortunes for the men who obtained franchises to build street and elevated railways. Here is a view of the New York Elevated in 1890, before electricity had taken the place of steam.

great cities. But there were then, in 1890, three cities of over a million each, New York, Chicago, and Philadelphia, and one-third of the people of the United States were living in cities of 8,000 or more.

Soon another type of fortune, also a growth of the city, was to join them. This was the franchise fortune, made by serving the traffic needs of the people of the cities as they went to work, and of the adjacent country as it became possible to live in the suburbs. There had been street-cars since the time of Jackson, and elevated railways in New York since Hayes. The electric trolley speeded the business. Since no line could be built without permission (*franchise*) from the city government, this change brought a new temptation into city government. In many cities a bribe for one or more officials was the price of a franchise. Meanwhile the various banking houses added to their millions, since they arranged the financing for the street railway corporations.

The Increase in Luxury

John Wanamaker was one of the rich who combined the accumulation of millions with a life of austere and sincere piety. But some of the new millionaires were less restrained. The lavishness of life increased, with more money to spend, and more luxuries to buy. The cities grew more elegant, better paved, better lighted; magnificent hotels became temporary homes for the rich and those who wished to appear rich. While

of all was the tariff, which the Republicans had promised to raise so as to protect any industry that needed protection. William McKinley, son and grandson of Ohio iron manufacturers, gave his name to the bill that was passed in the autumn of 1890. There were ominous mutterings against this bill in Republican states in the West. To silence these protests was one reason for passing the Sherman Anti-Trust Law (1890) which forbade the trusts to carry on interstate commerce if they were proved to be "conspiracies in restraint of trade." This act was never completely effective, nor was it popular with the business interests which controlled the party that passed it, but it was a matter of political necessity.

Another act of similar necessity was the Sherman Silver Purchase Act (1890) occasioned by the farmer demand for relief from low prices and high money. During the decade following the Bland-Allison Act (1878) the general prosperity was so widespread that "Greenbackers" and free-silver advocates had been reduced in numbers. But during the late 80's crops were poor in the Far West and South, and by 1890 farmers were again demanding cheap money (*see Money*). Their leaders persuaded them that a conspiracy of bankers and eastern Republicans existed to monopolize gold and raise its price, and that this monopoly caused the high value of the dollar and the low prices of commodities, a combination that made

it hard to pay debts. They claimed that the "crime of 1873" which dropped the silver dollar from the free-coinage list was part of the plot. They now demanded relief. The Sherman Silver Purchase Act (1890) required the Treasury to buy each month 4,500,000 ounces of silver bullion, and issue in payment therefor Treasury notes, which were themselves redeemable either in gold or silver at the option of the government. Harrison signed the law unwillingly. It failed to accomplish the desired purpose, for the price of silver bullion continued on its downward path.

In November 1890, by a huge landslide, the Democrats gained control of the 52d Congress, that was to sit from 1891 to 1893. Of deep influence in weakening the Treasury was a new pension law for Civil War veterans, that no longer required the pensioner to show disability suffered in the service. Need for help was enough, and the pension list rose to more than 1,000,000 names.

Harrison's strange gift for unpopularity weakened his administration by lessening the loyalty of Republican politicians to him. Approaching hard times and discontent in the West made his last two years in office unproductive.

Foreign Affairs

Blaine, in charge of the State Department, carried on a vigorous and distinguished administration. In his earlier term under Garfield, he had sought the coöperation of all of the American republics for their common advantage, and had issued invitations for a conference to be held in Washington. President Arthur had recalled these invitations, but they were now re-issued, and Blaine presided over the first Pan-American Conference in 1889-90. The Pan-American Union was a result of this, and a beautiful building in Washington, the gift of Andrew Carnegie, was later made its home.

There were other exciting diplomatic episodes that in three cases brought the United States near the verge of war. One was with Germany, one with Chile, and one with Italy. The first concerned the status of the Samoan Islands in the Pacific, in which the United States, Great Britain, and Germany had commercial interests. For 30 years the islands had been disturbed by the struggles of native chiefs for the throne. In 1888 Mataafa, with British support, was elected king in opposition to Tamasese, who was supported by German interests. The three

countries involved sent their warships to the islands, and only a hurricane, which sank three American and two German warships with great loss of life, prevented hostilities. Instead of fighting, the American seamen struggled to rescue the shipwrecked Germans and the matter was patched up. The three powers from 1890 to 1900 jointly controlled the islands under a protectorate.

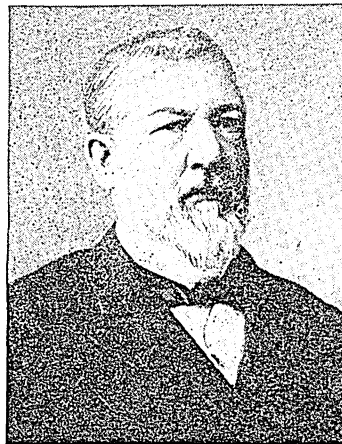
The trouble with Chile was due to an attack upon seamen from the U. S. S. *Baltimore* in the streets of Valparaiso in 1891. Both sides were to blame, but the United States demanded and received apologies under threat of war. With Italy the matter worked the other way. A mob in New Orleans in 1891 lynched several Italian subjects. The city had been intimidated by members of an Italian secret society, the Mafia, but the local jury had failed to convict them. Italy demanded at once that the United States punish the leaders of the mob, and withdrew the Italian minister from Washington in protest. Secretary Blaine had the

difficult task of explaining that under the American system the prosecution of criminals was a matter within the control of the state in which the crime occurred; that the United States government could not punish for such crimes; and that it could not even guarantee that the state would be vigorous in its prosecution of them. In the end the United States paid \$25,000 to each of the families of the lynched Italians.

The aggressive national policy which Blaine pursued led him to try to protect the seals of Bering Sea from extermination at the hands of the seal hunters. Sealskin coats were fashionable, and the hunters received high prices for the pelts. Blaine declared that the Bering Sea, nearly closed by Alaska and the islands belonging to the United States, was *mare clausum* (closed sea) to other powers. The United States had always denied the claim of any other country to own the ocean, and Great Britain now denied this claim of the United States. The matter was submitted to a special court of arbitration (1893); the court decided that legally the sea was open, and the United States could control only the "territorial waters," three miles off shore; but as a matter of equity the court restricted seal fishing (see Seal).

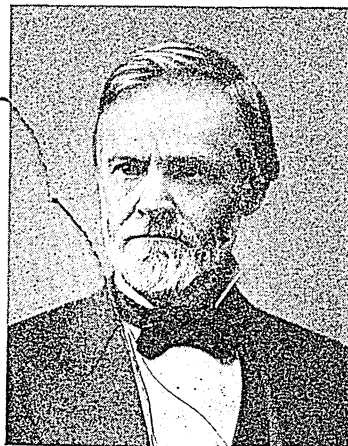
The general business of the State Department in these years had much to do with the rights of aliens who, having been naturalized in the United States,

JAMES G. BLAINE



Harrison's secretary of state, a vigorous fighter for American rights.

JOHN SHERMAN



Author of Anti-Trust Law which hurt Harrison with business interests.

returned to their old homes and found that their mother countries would not always treat them as citizens of the United States. This problem was especially vexatious in the relations with Germany, France, and Italy, from which many men came to the United States in order to escape the military service which those nations required of all their citizens. In Hayes' and Garfield's administrations many Irish had acquired American citizenship, and had then returned to Ireland to oppose English rule. There were, also, matters connected with the growing export trade of the United States, and the desire of European countries to exclude food from America. Meats were often excluded. Buffalo Bill, on tour with his Wild West Show, once found that he could not get his buffaloes into Germany because of a law forbidding the entry of "live cattle."

In 1892, Blaine suddenly resigned as secretary of state, three days before the Republican presidential convention. His candidacy for the nomination was not pushed, however, and Harrison was renominated, only to be defeated by Grover Cleveland. In the last months of the administration there were fears that before Harrison left office a financial panic would

break over the country. The Sherman Silver Purchase Law was flooding the Treasury with cheap silver, and confidence in the maintenance of the gold standard of money was lessening. The heavy investments and waste of the last decade had used up much of the free capital of the United States. The new railroads had brought into the markets so much wheat and cotton that it no longer paid to raise either. Farmers were even more discontented than they had been in 1890, and a new farmer party, the Populists, made its appearance with a candidate of its own, Gen. James B. Weaver. The panic was, luckily for Harrison, deferred until 1893.

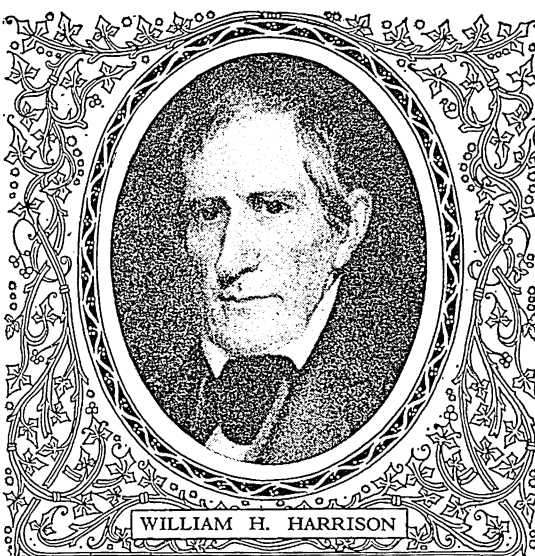
At the end of his term Harrison returned to Indianapolis, where he resumed the practice of law and steadily enhanced his fame as a lawyer. In 1898 he represented Venezuela in the arbitration of a boundary dispute with Great Britain. He was a delegate of the United States at the Hague Peace Conference in 1899. Two years later, March 13, 1901, he died. He wrote many articles for magazines, and published (1897) 'This Country of Ours', an account of the operation of the United States government; 'Views of an Ex-President' was published after his death.

The INDIAN FIGHTER Who Became PRESIDENT

HARRISON, WILLIAM HENRY (1773-1841).

If the frontier creates the characteristics which are peculiarly American, as has often been asserted, then William Henry Harrison was a typical American, for most of his public career was spent in the frontier wilderness of the Northwest Territory, or representing that region in Washington. But by birth and education General Harrison belonged to the aristocracy of Virginia. His father was a plantation owner in the tidewater region, who had taken a prominent part in Virginian politics during the Revolutionary War, and had signed the Declaration of Independence. After placing his signature to that immortal document, it is said that he remarked to Benjamin Franklin, "Now we must all hang together." "Certainly," said Franklin, "for you may be sure that if we don't, we shall all hang *separately*!"

As William Henry was the third son of the Harrison family, and the father's property would under the Virginia law of that time go chiefly to the eldest son, a profession was necessary for him. His father sent



The Hero of Tippecanoe, who was the ninth president of the United States and the first president to die in office. His administration lasted exactly one month, from March 4 to April 4, 1841.

him to Hampden-Sidney College, Va., 1787 to 1790, and then to Philadelphia to study medicine. But the young man disliked this calling, and at the death of his father, in 1791, he dropped it. President Washington then appointed him an ensign in the army.

Harrison's first active duty was under General Anthony Wayne, in the campaign in the Ohio country against the Indians. He served with distinction in the battle of Fallen Timbers, in 1794, and then was commander of Fort Washington, in Pennsylvania, until 1798.

In 1798 Captain Harrison (as he had then become)

resigned his commission in the army, and settled on a tract of land at North Bend, about 16 miles from Cincinnati. That same year President Adams appointed him secretary of the Northwest Territory under Gen. Arthur St. Clair as governor. This was the beginning of an official connection with the Northwest Territory, in which he served as delegate to Congress, as governor of "Indian Territory" after its formation (in 1800) and as superintendent of

Indian affairs. He was the first territorial delegate from any territory in the United States Congress. As such he rendered an important service to the people in obtaining a change in the land policy of the government, so that the public land was no longer sold in vast tracts to the wealthy, but in tracts small enough for the poorer settlers to purchase.

How He Won the Title of "Old Tippecanoe"

As superintendent of Indian affairs he made in all 13 treaties with the Indians, securing the cession of large sections of land in the Northwest. Tecumseh, a chieftain of the Shawnee Indians, and his brother the "Prophet" objected to this giving up of the Indian lands, and claimed that the consent of all the tribes was necessary before the cession could be valid. The chiefs, they said, had "no right to barter away the land for a pewter ring or a keg of liquor." The result was a formidable Indian War, in which Governor Harrison defeated the Indians at Tippecanoe, near Lafayette, Ind. (Nov. 6-7, 1811). This victory made Harrison a national hero, and he was admiringly called "Old Tippecanoe." (See Tecumseh.)

In the War of 1812, Harrison with the rank of major-general was in supreme command of the forces in the Northwest. He urged the construction of a fleet on the Great Lakes, and, after the victory of Commodore Perry on Lake Erie, Harrison crossed into Canada. In the Battle of the Thames (Oct. 5, 1813) he defeated the British and put an end to the war in Upper Canada.

Because of difficulties with the secretary of war, General Harrison resigned his commission in 1814. In the following years his admiring fellow-citizens sent him to the United States Congress and to the Ohio State Senate, and in 1828 he was appointed minister to Colombia. But within a year he was recalled from the latter position and retired to his farm near North Bend.

His Nomination for the Presidency

In 1836 General Harrison was nominated by the Whigs for the presidency, and though defeated by Van Buren, he succeeded in carrying seven states. In 1840 Harrison was again the Whig candidate against Van Buren, who was seeking reelection. The campaign of that year marked a new era in American politics. With it began the monster meetings, the carnival pomp, and the doggerel verse which for years after marked presidential elections. One part of Harrison's residence at North Bend was a log cabin covered with clapboards; and at the opening of the campaign one of his admirers said that his table, instead of being served with expensive wines, was supplied with cider. So "log-cabins and hard cider" immediately appeared at all the Harrison meetings. The cry "Tippecanoe and Tyler too" carried the Whigs to overwhelming victory, making Harrison president and Tyler, vice-president. (See Tyler, John.)

But the strain of the campaign, and of dealing with the multitude of office-seekers in the months that

followed proved too much for General Harrison's strength. Although in apparent good health at the time of his inauguration, he soon fell ill of pneumonia and died on April 4, 1841—just one month after he took office. He was the ninth to hold the presidential office, and the first to die during his official term.

It is useless to speculate as to what sort of a president he would have made. On the one side are those who hold that "he was not a great man, though he lived in a great time, and he had been a leader in great things." On the other hand, it is pointed out that he was one of the best territorial governors ever appointed in the United States; and that there is no reason for thinking he would not have shown on the national stage the same qualities of broad-mindedness, integrity, tact, courage, and resourcefulness that he had displayed in the lesser drama of the frontier.

HARTE, FRANCIS BRET (1839-1902). When Bret Harte caught the spirit of the lawless primitive life of the early California mining camps and put it into his vivid short stories, he did a new thing. He started the American story of local color and atmosphere, which sprang into instant popularity. He knew the life he wrote about for, though he was born in Albany, N.Y., he had lived in California since he was 15, teaching, mining, and setting type. While he was at work in a San Francisco newspaper office he wrote the first of his sketches and was at once promoted to the editorial staff. He became editor of *The Overland Monthly*, in 1868, and contributed to it 'The Luck of Roaring Camp' and 'The Outcasts of Poker Flats', the most famous of his stories of rough western life. Harte had a talent, too, for humorous verse, and the nation laughed at his 'Heathen Chinee', the Chinaman with the "smile that was childlike and bland," who turned the tables on two white men who tried to cheat him at cards:

Which is why I remark,
And my language is plain,
says Truthful James, who tells the story—
That for ways that are dark
And for tricks that are vain,
The Heathen Chinee is peculiar.

Bret Harte's fame had spread so far, meanwhile, that the *Atlantic Monthly* asked him to write for it alone. He went east in 1870, lectured awhile on California life, then was sent as consul to Crefeld in Germany, and later to Glasgow, Scotland. His last years, after 1885, were spent in England, where he died. He was the author of many other short stories and one long novel, but his first stories remained the best. He wrote some serious poems, too, of which certain ones deserve a wider reading than they receive.

Bret Harte's chief works were: Stories: 'The Luck of Roaring Camp' (1868); 'The Outcasts of Poker Flats' (1869); 'The Twins of Table Mountain' (1879); 'In the Carquinez Woods' (1883); 'A Phyllis of the Sierras' (1888). Novel: 'Gabriel Conroy' (1876). Poems: 'The Heathen Chinee' (1870); 'East and West Poems' (1871); 'Echoes of the Foot-hills' (1874).

HARTFORD, CONN. Business foresight and an advantageous situation have combined to make Hartford one of the chief cities of New England. Time and again, new kinds of businesses have been developed to meet changing economic conditions. The capital and largest city of Connecticut, it is now known as the "Insurance City." More than 40 insurance firms have headquarters here, and the towering offices of the largest dominate the sky line.

Standing at the head of navigation on the Connecticut River, Hartford was important in colonial days as the trade center of the fertile valley. With the growth of ocean commerce, it became a shipping port, and its bankers wrote marine insurance. When shipping was crippled by the War of 1812, new companies were formed to write other types of insurance.

Hartford was also quick to take up manufacturing, and produced goods for the famed "Yankee peddlers." When the nation turned to large-scale manufacturing, Hartford's supply of skilled artisans made it a natural center for making tools and machinery. Today, with its suburb East Hartford, it makes turbines, precision tools and machinery, airplanes, airplane motors and propellers, organs, firearms, brushes, electrical fixtures, typewriters, and many other products. It is still the trade center of the valley and a key market for Connecticut tobacco.

Historically, Hartford is a symbol of democracy. Only four years after its founding, delegates from the river towns met here (1639) and adopted a frame of government known as the Fundamental Orders. This document, which declared that "the foundation of authority is in the free consent of the people," has been called the first constitution in America. In 1662 independence was granted to the colony, and when Governor Andros demanded that the charter be given up in 1687, the document was hidden in an oak tree. The historic spot is marked by the "Charter Oak" monument in downtown Hartford.

A distinguished show place is the Old State House, built in 1796. On Capitol Hill are several impressive state buildings. Other notable buildings are Wadsworth Atheneum, Avery Museum, Trinity College, and Hartford Seminary Foundation. The Colt Memorial Museum honors the firearms pioneers; and the Morgan Memorial, the J. Pierpont Morgan family. Other famous residents of Hartford were Noah Webster, Harriet Beecher Stowe, Charles Dudley Warner, and Mark Twain. Population (1940 census), 166,267.

HARZ (härtz) MOUNTAINS. Few mountain chains are as small as the Harz; yet this craggy range of northern Germany is noted for its beauty and for its treasure of minerals. An isolated chain, it rears abruptly from the sloping plain between the rivers Weser and Elbe, extending northwest for 57 miles. Its greatest width is about 20 miles. The highest part, the northwestern, is the Upper Harz; the southeastern is the Lower Harz. As the first barrier to the sea winds from the north, the summits are cold, damp, and often clouded by mist. The weathered crests of the Upper

Harz are barren, but the lower slopes are green with forests of pine, fir, and beech. In the Lower Harz much of the upland is pasture and, as in Switzerland, cattle are belled and driven up in spring and left till winter comes. All the valleys are deeply wooded. Through them, the Bode, the Ilse, and other swift streams plunge.

The natural beauty is enriched by picturesque traces of the Middle Ages. Turreted castles guard many of the highlands, and in the valleys are little towns with gild halls, market squares, and churches built in medieval days. A favorite is Goslar, with a palace perhaps a thousand years old. In both summer and winter, the Harz is a popular tourist resort. A network of railways, roads, air routes, and bicycle trails brings travelers to the spas, youth hostels, and rustic mountain inns. To reach some parts, cogwheel and funicular railways have been built.

The highest peak is the Brocken, a granite dome, with an elevation of 3,746 feet. This was a stronghold of Teutonic paganism long after Christianity arose elsewhere in Germany. In pagan times, the "witches' dance" on the Brocken was marked by a festival on April 30, Walpurgis Night. This is described by Goethe in the poem 'Faust'. The modern fête is now one of several annual celebrations on the Brocken. The peak is famed for a phenomenon called "Specter of the Brocken." This is the hugely magnified shadow, seen on the clouds, of persons standing on the summit between the clouds and the sun. Similar phenomena have been seen on other peaks or from aircraft.

Its mines have been worked since the Middle Ages, and the Harz is still one of Germany's richest mineral regions. It is the chief domestic source of copper, and it also produces lead, silver, and iron. Other leading industries are lumbering, paper making, and stock raising. Many of the people breed the famed Harz Mountain canaries, training them to sing in a notably clear, pure tone. Large numbers of these birds have been imported into the United States.

HASTINGS, BATTLE OF (1066). Duke William of Normandy, who claimed the throne of England against King Harold, succeeded in landing his army without active opposition at the town of Hastings, on the English Channel. At dawn on Oct. 14, 1066, he roused his troops and set out on an eight-mile march to attack the English, who had occupied the crest of a steep curving hill. The English were about as numerous as the Normans, and were packed closely together on foot, protected by their great shields. They repulsed attack after attack of the mounted Normans, hurling darts and lances, and using their long-handled battle-axes with terrible effect. A blow from one of these nearly struck William from his horse, but his helmet, though badly dented, saved him.

Toward evening Harold was struck in the eye by an arrow and fell mortally wounded. His two brothers were already slain, and the picked troops who guarded the dragon standard of Wessex were killed fighting to the last. The rest then fled and

victory remained with the Normans. Right among the dead where the English standard had stood and where his own now waved, William had his tent set up and his supper brought to him. In after days Battle Abbey was erected there to mark the spot. This battle was the beginning of the Norman conquest of England which won for William the title of "Conqueror" (see William, Kings of England).

Many incidents of the battle, together with the costumes and weapons of the fighters, were pictured by Norman needle-women on a famous piece of embroidery known as the Bayeux Tapestry. This interesting relic of the Middle Ages is still preserved in the public library of Bayeux, France.

Hastings is still a thriving English town, with a population of about 65,000.

HASTINGS, WARREN (1732-1818). If it was Clive who laid the foundations of the British power in India, it was his successor, Warren Hastings, who built on those foundations in such a way as to produce the Indian Empire of today.

Born in the same year with George Washington, Warren Hastings was early left an orphan under the care of an uncle who sent him to the famous Westminster school in London. He proved a good student, but his hopes of a university education vanished when his uncle died. A clerkship in the East India Company at Calcutta was obtained for him, and there, like Clive, he arrived at the age of 18. When Suraj-ud-Dowlah marched on Calcutta and committed the Black Hole crime (see Clive, Robert), Hastings was at a cotton factory near Calcutta and for a time was held prisoner. When Clive marched against the Indian prince, Hastings joined his force as a volunteer and helped to recover Calcutta. Clive recognized his abilities and made him agent of the Company at the court of one of the native princes.

After 14 years in India, Hastings returned to England in 1764. He was now able to indulge that taste for literature which stayed with him all through his Indian career, and met Dr. Johnson and other London literary lights. But Hastings did not lose touch with affairs in India. Through Clive's influence he was appointed to the governing council in Madras, and then, in 1772—following Clive's retirement and the most terrible famine in India's history—Hastings was sent back to India as governor of the province of Bengal. Two years later the districts of Madras and Bombay were brought under his control and he was made governor-general for the Company in India.

Extension of Britain's Indian Empire

His administration, which lasted until 1785, marks a great epoch in the extension of British rule. In the beginning the East India Company was merely a *trading* corporation, having nothing to do with governing the land outside of its few trading posts. Now it took over in addition the chief work of government in wide stretches of the land—collecting the taxes and maintaining armies, and leaving to the native rulers of those provinces only shadowy power.

Elsewhere also the Company undertook to furnish the princes with military protection in return for large money payments.

This was a period of great unrest in India. The Mahrattas, a warlike Hindu people of western India, and other races were planning to seize rich sections of the peninsula. Hastings had to watch the interests of the Company and wage wars for the protection of their territories. Meanwhile the French were plotting in the south with powerful Indian princes. Hastings found difficulty in finding money for these various wars, for many of the princes had failed to pay the sums due for their protection. Hastings accordingly forced the Raja of Benares to pay up, and also collected arrears from a weak prince in Oudh who claimed that his mother the Begum (queen) held all his money. These two debts collected, Hastings had money enough for the war in the rich plains near Madras, where Hyder Ali with a huge army was laying waste the land. After defeating two British generals, Hyder Ali was routed by General Coote, and his French allies driven from the sea by a British fleet.

Hastings tried also to reform the Company's service, which had become corrupt after Clive left India. The word "nabob" (*nawab*) originally meant a rich Indian ruler, but so many English traders and soldiers made enormous fortunes and returned to England to spend their ill-gotten money in cheap display, that the word soon was applied to this type of adventurer. Hastings, who spent his own leisure in learning Persian, tried to get the English agents to study the languages and customs of the Indians. He also sought to open trade with Tibet, and to open communication with Europe along the ancient Red Sea route. He left India with the Company's government firmly and justly administered. He retired in 1785, after finishing Clive's great work.

The Unjust Impeachment of Hastings

Hastings' measures in India naturally had created for him a host of enemies, both among the native princes and among the English. Chief of these was Philip Francis, a member of his council, whom he had wounded in a duel at Calcutta. At home the orator Burke and the playwright Sheridan took the lead in demanding Hastings' impeachment by Parliament. For seven years the trial dragged on, and although it ended in his acquittal the great expense made him a poor man. It is chiefly to Lord Macaulay's essay on Hastings that his critics turn when making charges that he had robbed the Begum of Oudh, and other princely rulers of India. Macaulay, who lived in Calcutta for four years as a council member, could have known the facts, but he took little pains to verify the charges, and these have since been proved false.

Hastings died in 1818 at the manor where his ancestors had lived. His last years brought him many public honors, and he died regretted by a host of Indian and English friends and admirers as one of the founders of the British empire in India.

The Story of HATS and HOW THEY ARE MADE

What Endless Variety in the Headgear of Different Peoples!—The History and Geography of Hats—A Visit to a Felt Hat Factory—Why Panamas Cost So Much—Why Men Lift Their Hats to Women

HATS AND CAPS. If we could assemble specimens of the headgear of every land and age on one gigantic hat rack, what an amusing and interesting sight it would make! The fur hood of the Eskimo would stand beside the Mexican's high peaked hat; and between the glossy silk hat of civilization and the huge umbrella-like straw hat of the Burmese would glow the turban of the Mohammedan and the bright bonnet of the Scotch Highlander. The cone-shaped hats of the early Aegean civilization—4,000 years ago—and the tall cylindrical headgear of the Hittite kings and queens would present a fascinating contrast to the cocked hat of Washington's time and the cowboy hat of the western plains. The stiffly wired cap of the Norwegian bride would be there, and the round beaver fur hat, lined with red satin and adorned with a diamond clasp, that Charles VII of France wore when he made his triumphal entry into the city of Rouen in 1449.

Why such a marvelous variety of forms? Partly to serve particular needs, partly just for ornament. In regions of great heat or intense cold, protection is the first purpose of head covering; but in the civilized countries of the temperate zone, where it is rarely excessively hot, cold, or wet, hats vary greatly in shape, size, and material. Bright colors are common; hats are designed, to a great extent, for decoration; and fashion determines the materials. These materials are gathered from all over the world—straw from the Philippines, Italy, and Japan; rabbit fur for felt from Australia and central Europe; silk from China, Italy, and Japan; fancy furs and feathers from a score of lands. In countries not so advanced, where there is little foreign commerce, the materials used for clothing must be those close at hand, and a head-dress once adopted is used for centuries.

In the western world men's hats change from season to season in minor details of shape and trimming, but the principal types have remained unchanged for many years—the straw hat, the silk hat, and the felt hat, the last including the soft hat and the stiff hat or derby. Besides these there are the popular cloth hats, made of woolen or cotton fabrics, stiffened by many rows of stitching and sometimes by shellac. Caps also are largely worn for informal wear.

How Felt Hats are Made

If ever you get the chance, visit one of our great felt-hat factories, and see how your derby or soft hat has grown out of a few scraps of fur from an animal that once scampered over the plains of Australia, Argentina, or Canada. For the finer grades, fur alone is used; but cheaper hats are made from a mixture of

wool and fur, or wool alone. The first step is to clean and brush the fur while it is still on the skin and "carrot" it by brushing on nitrate of mercury to make it felt more easily. Then a machine shears off the fur, which passes on an endless belt to blowing machines. In these the soft fluff is torn apart by steel teeth and freed from hairs or foreign material.

Now begins the transformation into a hat. The exact amount of fur needed to make one hat is passed to a boxed-in machine, which contains a minutely perforated copper cone about three feet high. As this cone revolves, myriads of the mistlike fur particles are drawn by suction to its damp outer side, forming a thin covering of felt. A wet cloth is thrown over this matted fur, another cone is pressed over it, and the whole is immersed in a tank of hot water until it felts under the pressure. The delicate cone of felted cloth is then shrunk to the proper size, dyed, and given a bath of shellac to stiffen it—weak shellac for soft hats, and a denser solution for stiff hats. The cone is now plunged in boiling water and flattened at the crown, so that it begins to take on the appearance of a hat. It is stretched, blocked, and pulled with the aid of hot water, steam, and ingenious machinery, until it has taken the desired form. Stiff hats are put in a hydraulic press to increase their rigidity, and the brim is curled by being pressed on a flange by a bag of hot sand. The rough surface is smoothed by rubbing with emery paper, the trimming is put on, and last of all the leather sweat-band attached—and the hat is ready.

Straw and Panama Hats

Straw hats are made from high grade imported straw. The braids, except for some expensive hats, are sewed and pressed into shape by machinery, after being sized with waterproof gum. Panama hats are made from a fine, light "straw" obtained from the leaves of a shrub (*jipijapa*, or *toquilla*) that grows chiefly in Ecuador, though it is also found in Colombia and the forests of the upper Amazon. The best hats take five or six months to complete, since the fibers must be kept thoroughly moistened and the weaving is done only in the late twilight or early dawn.

In the manufacture of silk hats several layers of cotton material are cemented together with shellac. This "body" is pressed into shape on a block, and the rim is cemented to it. Then it is coated with shellac, covered with silk plush, trimmed, and finished.

The manufacture of hats and caps is an important industry in the United States, centering in New York and Philadelphia, although there are large hat factories in Orange and Newark (N.J.); Danbury, Bethel, and Norwalk (Conn.); Brooklyn (N.Y.), Reading (Pa.), and in many other industrial centers.

Women's hats are made in factories, wholesale workrooms, and—the more expensive ones—in small shops which sell direct to the customer. These factories and shops buy "hat bodies," usually made of felt or straw, which have already been cut on a hat form, and these are shaped, blocked, and trimmed. Styles in women's hats are ever changing, chiefly under the influence of Parisian designers.

Some Curious Facts about Hats

Did you ever notice the tiny bow that decorates the lining or inner band of most hats, both men's and women's? Not so very long ago, hats were made in only a few sizes, and a drawstring was inserted in the lining, which was tightened or loosened to fit the head. The little bow is a relic of that old practice, although it also serves the purpose of marking the back of the hat. Nearly all these bows are made in Geneva, Switzerland.

The ancient Greeks, when traveling, protected their heads with a flat, broad-brimmed hat of felt which tied under the chin and hung down the back when not needed, like a sunbonnet of today. These tie strings are still preserved in the streamers around the crown of a child's sailor hat.

During the 14th and 15th centuries, women's hats, caps, and hoods were of the most extravagant shapes and sizes. Some were horned, others were great peaks, like the "dunce-cap," from a foot to three feet in height. Sometimes a veil would be draped over these towering structures, falling the length of the dress.

Hats have often had an important place in distinguishing sects and parties. The Puritan wore his severe high-crowned hat over his cropped head as a rebuke to the cavalier of the time, with his hair in curls, and a great sweeping plume on his low-crowned hat. The Quaker affected a broad-brimmed gray hat (still to be seen in some conservative communities) which he refused to doff to any man—only to his Maker. In the Roman

Catholic and Anglican churches hats and other forms of headgear have a conspicuous place in the differences of costumes which distinguish various ranks and orders of the clergy. During the greater part of the 18th century, two rival political parties in Sweden, known as "Hats" and "Caps," were in constant struggle, the "Hats" representing the nobles, and the "Caps" being the party of the common people. These names were slogans in some bitter battles.

In the English House of Commons members may wear their hats while seated, but take them off when they rise to speak. But in one special case—after a debate has been closed and a vote ordered, but before it is actually taken—a member who wishes to raise a point of order must speak seated and with his hat on. The great Gladstone once ran foul of this custom. He had wandered away from his seat bare-headed, and wished to speak on a point of order as a vote was about to be taken.

"Hat! hat! hat!" cried the members in riotous glee as he started to speak. A nearby member lent him a hat, but it was several sizes too small for Gladstone's massive head. With this perched ridiculously atop his head, the "Grand Old Man" was allowed to proceed. This incident illustrates only one of many points of etiquette regarding the hat in the House of Commons. The session is dismissed when the Speaker (the presiding officer) rises and puts on his hat.

Formerly inferiors were required to uncover in the presence of superiors as a mark of respect. Today this custom survives chiefly in the custom of removing the hat in the presence of royalty and other distinguished persons, and of raising it to ladies while out of doors.

HAVANA, CUBA. A blinding tropical sun beats down upon the narrow white pavements, palm-fringed baseball park, glaring marble palaces, modern office buildings, old gray churches, and gay-colored Spanish houses of Cuba's capital. It blazes upon the concrete docks and forests of masts along its teeming water front, and brightens its background amphitheater of palm-fringed hills.

This is Havana—a city that has truly been called "Spain with a modern American virility, tinged with a generous dash of the tropics." It is, on the one hand, a quaint city of plazas, bazaars, cafés, and lottery, cigar, and wine shops; a city where the boom of ancient cathedral bells mingles with the clang of cart bells and the cries of street vendors as they press their way in and out of old market places piled high with tropical fruit, vegetables, and many-colored fish, and wander down cobbled lanes here and there topped with canvas canopies and edged everywhere by one-story plaster-faced houses with balconies, flat roofs, jutting iron-barred windows, and arched doors leading to dim *patios* or courts.

On the other hand, Havana is curiously modern, with a distinct American flavor. Baseball is now a well-accepted substitute for bull fights and a pretext

THE STREAMERS



Streamers on hats are reminders of the tie strings on the ancient Greek traveling hats.

STORY OF THE LITTLE BOW



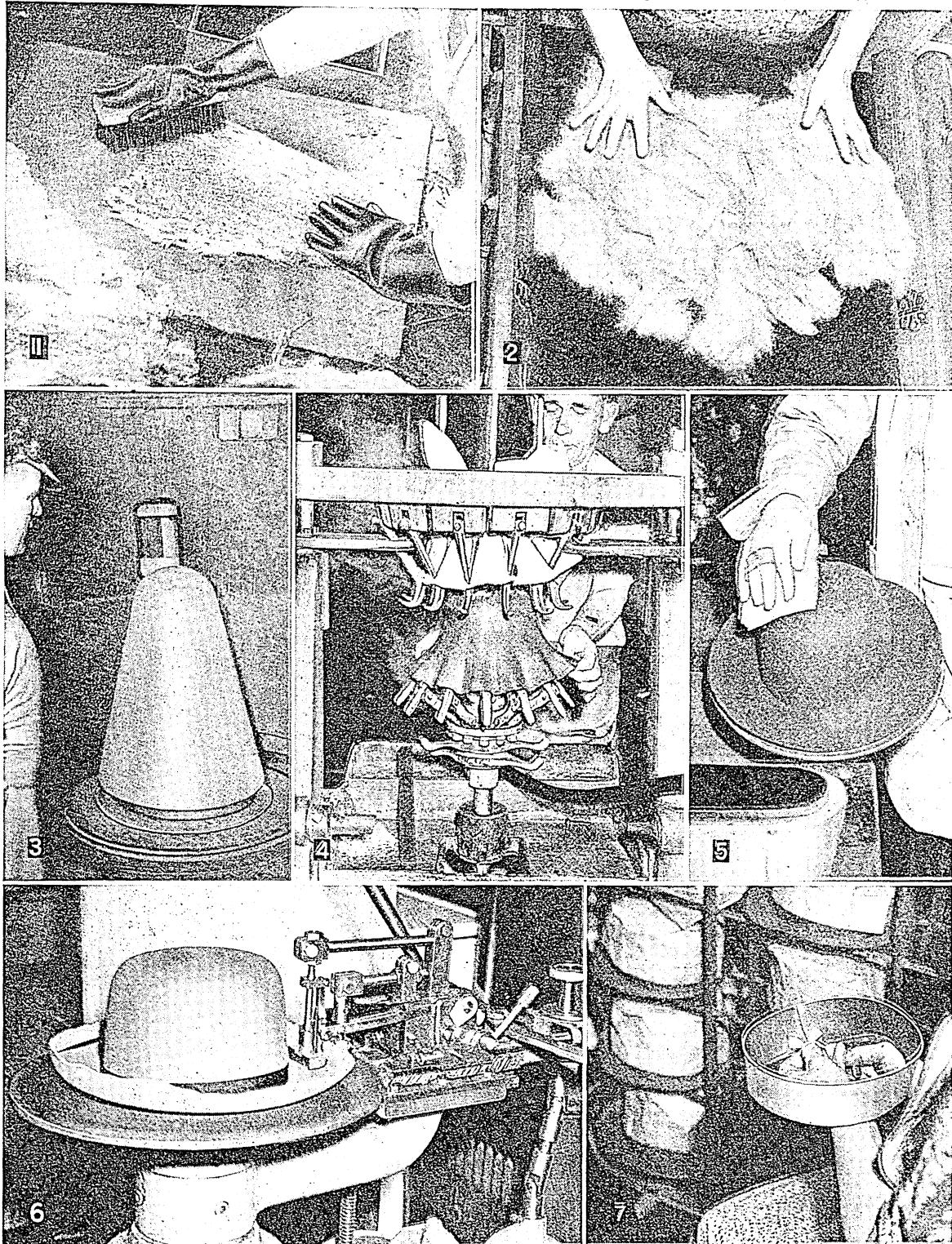
The little bows inside men's hat bands are relics of the drawstring used in olden days to make hats fit.

THE ANCIENT HAT BAND



The old Egyptians wore a band to keep their hair in place. We have kept the band but put it on the outside of our hats.

FROM RAW FUR TO FINISHED FELT



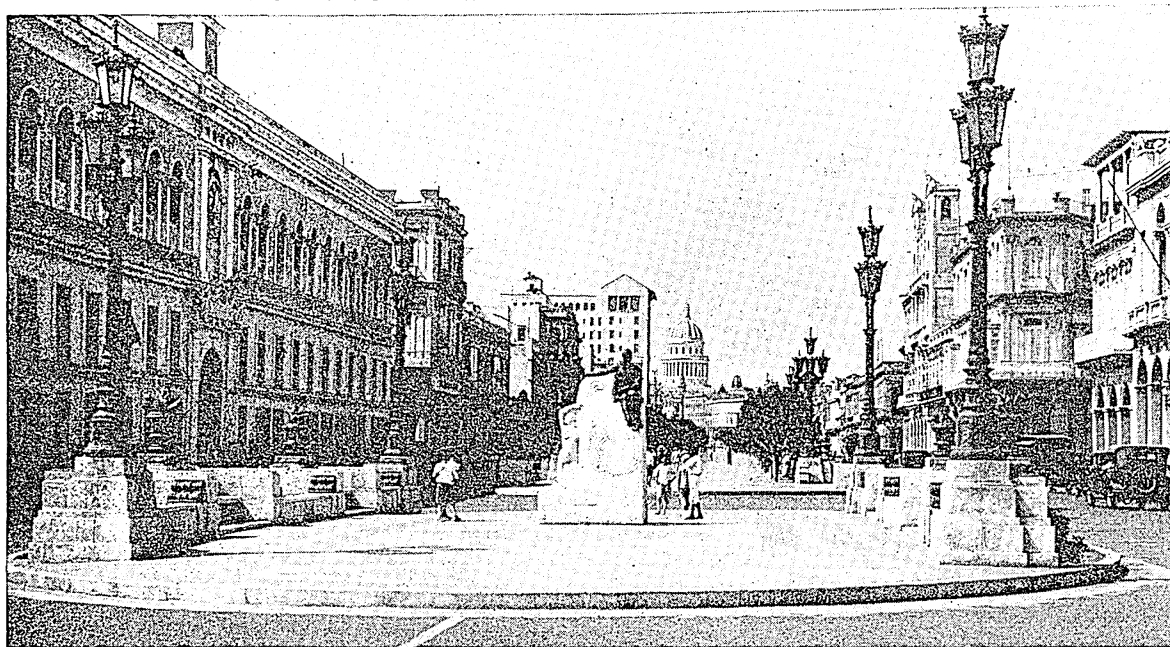
The first step in making a felt hat is to clean and strengthen the fur with a chemical applied with a strong brush (1). This is called "carroting." After the fur is sheared from the hide, and aged in storage, it is fed into a blower (2), which tears it apart and separates the remaining dirt and skin particles. It is then ready for the "forming mill," an enclosed machine in which the fur is drawn by air suction over a copper cone (3). The operator then wraps a burlap cloth around the cone, drops a tin form over it, and im-

merses the form in hot water. This process partially felts, or mats, the fur. After further treatment to harden and shrink it, it is stretched over a machine (4), which pulls out the edge to form a brim. Next, the felt is put upon a form block and gallons of cold water run over it. This completes the felting and shaping. In the various finishing steps the hat is rubbed with sandpaper, an operation called "pumicing" (5), the brim is flanged or curled up and cut to the proper width (6), and the inner band is sewed on (7).

for as much betting; "jitney" automobiles, which are for hire everywhere, compete with clanging street-cars in mad rushes up and down the narrow old streets. The uniform of the khakied Cuban soldier is American and so too are the bill-boards, the electric signs, and the mail boxes. At all points there is thus a curious dovetailing of the old and the new. Office buildings, theaters, hotels, and clubs shoulder crumbled Spanish

by mansions of the planter aristocracy, for its public gardens, university, and its drives—such as the beautiful Prado, with its double row of laurels and other shade trees and graceful palms running along a parkway in its middle; a city noted for its old cathedral dating back to 1724, where until 1898 the body of Columbus was said to have remained; for the picturesque old forts of Morro Castle, La Cabana, and

LOOKING DOWN THE PRADO IN HAVANA



Cuba is very proud of her beautiful new \$15,000,000 capitol building at Havana, which was formally opened at the second inauguration of President Machado. We can see the splendid white dome of the new capitol in the picture above, as we look down the Prado, finest street in Havana. This street begins at Punto Castle, and follows the line of the old city wall to the Parque de Colon. It is lined with handsome buildings made chiefly from the limestone which underlies the island. The buildings rarely rise above three stories, and their upper stories project over the sidewalk, forming shady galleries.

churches; the latest factory products are found in quaint old-time markets; modern ferries chug across the harbor beside queer old row-boats with awnings at the rear; old convents have been transformed into post-offices and homes of warehouse brokers and customs officers.

Havana is the largest and most important commercial city in the West Indies, a city of busy factories, banks, and stores of all description. Its railways shoot out to every important island center. At its doors is one of the safest harbors of the world, where 4,000 ships enter every year flying flags of many nations and laden with cargoes from the United States, Spain, and South America. These same ocean-going vessels then fill their holds with cigars, tobacco, and sugar, three-fourths of which goes to the United States. Havana possesses some of the largest cigar and tobacco factories in the world, although she makes other things, too, such as boxes, barrels, wagons, and carriages.

And last of all there is the Havana that the tourists so admire, the city famous for its promenades edged

Punto Castle, that guard the entrance to its harbor; for the Governor's fine palace; and for the many seaside resorts near by.

In the older parts, Havana is still rather neglected looking, although it is much cleaner and more sanitary than it was before the United States military occupation in 1898, when the Americans helped to clean it up and eradicate its yellow fever. The newer portions of the city are modern, picturesque, and well laid out.

Havana is situated on the north coast of Cuba on a sort of peninsula between the Gulf of Mexico and the land-locked harbor. It was founded by Velasquez in 1519. It remained the chief city of the Spanish power in the West Indies till near the end of the 19th century. In February 1898 the United States battleship *Maine* was blown up in its harbor, and during the Spanish-American War that followed, the city was blockaded by the United States fleet. With the emancipation of Cuba from Spanish rule, Havana became the capital of the new republic. Population, about 550,000.

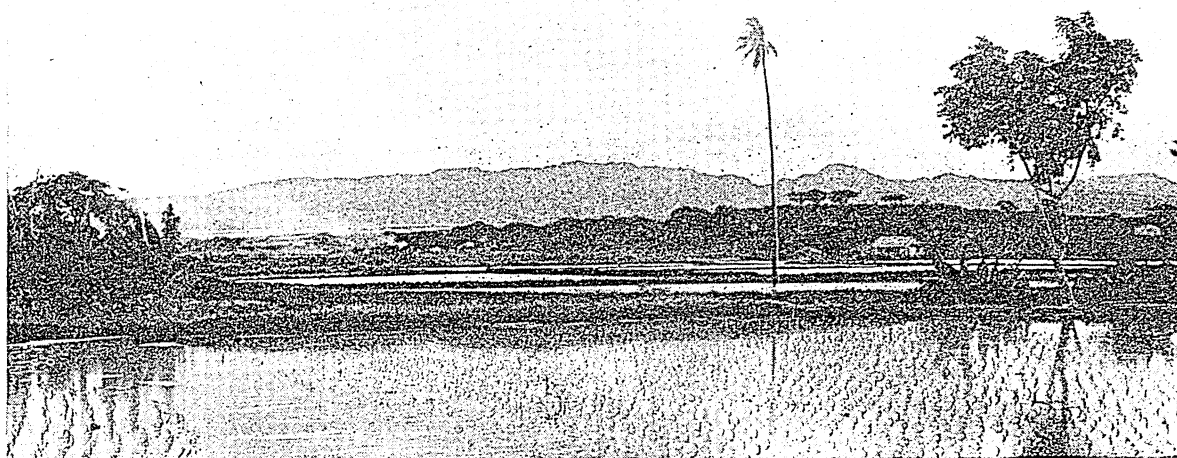
HAVRE (*äv'r'*), FRANCE. The second largest port in France, Havre is called the seaport of Paris. It is 108 miles northwest of the capital, at the mouth of the river Seine. The French call it Le Havre (the harbor). It was only a fishing hamlet until 1516, when Francis I fortified it and began the construction of the harbor.

After the first World War a plan for harbor development was undertaken, including the building of a gigantic breakwater across the entrance channel to form a new great outer harbor and to serve also as point of arrival and departure for seaplanes. Enormous

new warehouses were built. A large basin was constructed in the outer harbor to take care of the petroleum trade, and huge storage tanks were provided. These and other improvements made Havre one of the world's largest and finest harbors. In the second World War these new works suffered extensive damage from bombing attacks, first by Germany and later by Great Britain.

Normally the port is a distribution center for many tropical products, notably cotton and coffee. Important manufactures of the city include ships, chemicals, and lace. Population, about 165,000.

A PARADISE of the PACIFIC



We are looking here across a Hawaiian rice field. It occupies a low-lying terrace near the coast which has been flooded by the rice growers. In the distance are some of the rough volcanic hills which cover the interior of the islands. The land is remarkable for its varied scenery and luxuriant vegetation.

HAWAIIAN (*hä-wi'yän*) ISLANDS. In mid-Pacific, 2,000 miles away from any important land mass, lies the important group of islands that constitutes the Territory of Hawaii. They are scattered over a distance of nearly 2,000 miles, but only eight of them are large enough to support a permanent population. Their total area is considerably less than that of New Jersey and their population is about the same as that of Newark. But their strategic value to the United States is enormous. Only ten hours from California by air and six days by water, this "crossroads of the Pacific" is a convenient base from which nearly the whole Pacific Ocean can be patrolled and the western approaches to the Panama Canal can be guarded (*see Navy*).

The Hawaiian Islands are really the tops of 15 or more enormous volcanoes which have been built up

Extent.—Length of eight main islands, about 400 miles. Extent of entire island chain, nearly 2,000 miles. Total area, 6,407 square miles (island of Hawaii, 4,015 square miles). Distance from San Francisco, 2,091 nautical miles; from Yokohama, 3,394 miles. Population (1940 census), 423,330.

Natural Features.—Islands of volcanic rock rising to mountain peaks from 18,000 feet below the sea and fringed with coral reefs. Highest peak, Mauna Kea, 13,784 feet; Mauna Loa, world's largest volcano; Kilauea, world's largest active crater. Climate semitropical; the latitude is about that of Cuba.

Products.—Cane sugar, canned and fresh pineapple, coffee, bananas, potatoes, rice, tobacco, cotton; meat, hides, honey, wool.

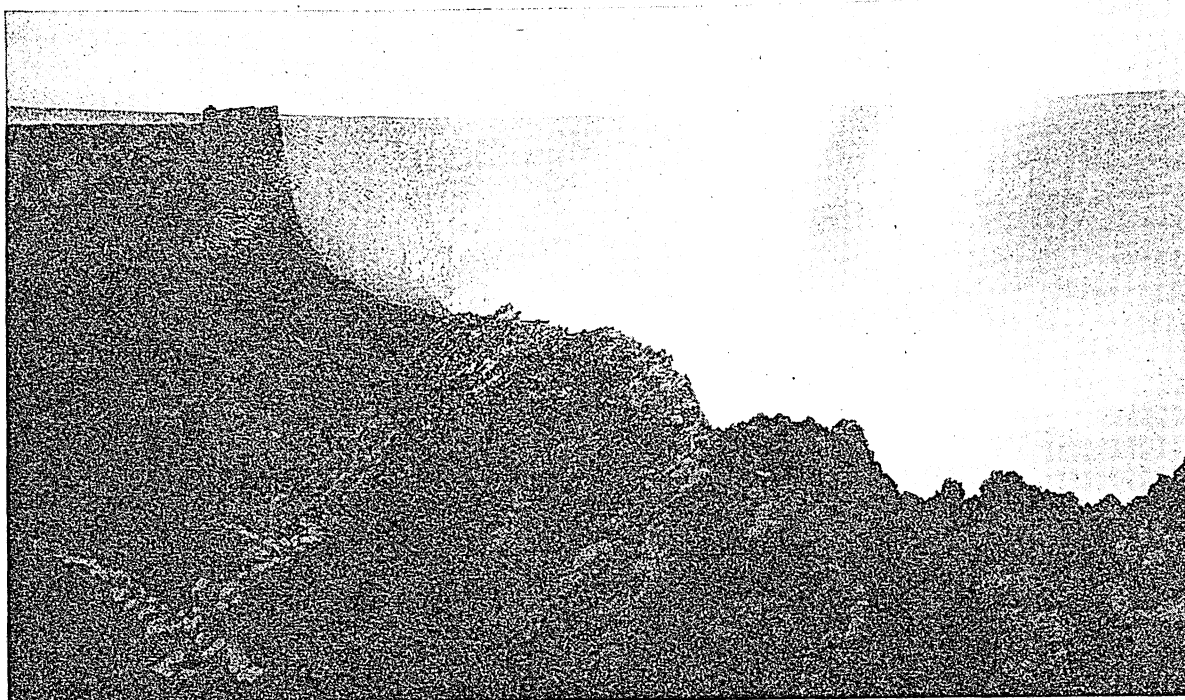
Cities and Harbors.—Honolulu (capital, 179,358), Hilo (23,353); Pearl Harbor, important United States naval base.

from the bottom of the ocean. Hawaii, the largest and most southerly island, consists of five volcanic mountains which have encroached upon one another by their eruptions. Several islands, like Maui, consist

of "volcanic twins" united at the base, while others are built around a single cone. There are now no active volcanoes except on Hawaii; but all the islands are mountainous, in many places rising from the sea in sheer cliffs hundreds and even thousands of feet in height. The valleys are remarkable for their beautiful scenery, the swift short rivers having cut many deep ravines and picturesque gorges, some of which almost rival Yosemite.

Nowhere will you find a more healthful and delightful climate than in this Paradise of the Pacific. Cooled in summer and warmed in winter by the

KILAUEA AND ITS LAKE OF FIRE



A vast kettle of molten rock—that's what the crater of Kilauea is! You see the walls are brilliant with the reflection from this fiery cauldron. The oval crater is nine miles around. The lava rises and falls great distances. When this picture was taken it was only 400 feet from the surface and over-flowed three weeks later.

ocean winds, it is seldom too hot for comfort and never cold. The average annual temperature at Honolulu is 75°, with only about 5° difference between summer and winter. Rainfall is heavy on the northeast slopes of the islands, where the trade winds deposit their moisture; in some places it amounts to 300 or 400 inches a year. On the southwest slopes it may be as little as 10 or 15 inches, and crops have to be irrigated. Only 8½ per cent of the land is cultivated, but on this small area the rich volcanic soil yields crops of prodigiously high value to the acre.

Honolulu, the Beautiful Capital

As your ship steams into the beautiful harbor of Honolulu, the capital, on the south coast of Oahu, you look out over a crescent-shaped beach fringed with coconut trees, and the white and pink roofs of a town almost hidden in luxuriant foliage. Behind it are yellow-green plantations, and in the distance the misty bluish purple of the mountains. The harbor is crowded with fishing boats, ocean liners, and freighters. These ships bring food and manufactured goods to the islands and return to the States with sugar, coffee, and fruit worth more than \$100,000,000 in a single year. Near the dock the water is alive with brown-skinned boys swimming about and shouting, ready to dive for coins

which the passengers throw into the water. If it were not for its tropical setting and its varied population, Honolulu about the harbor would look very

much like any other American city. Its wide paved streets, its government and office buildings, radio stations, and street-cars are no different from those of the American mainland. It has fine parks, hotels, clubs, schools, and churches, and one of the finest aquariums in the world. But outside the business center, luxuriant gardens with tropical flowering trees everywhere remind the visitor that he is in a strange clime. Few too are the white faces, compared with the yellow and brown. Most noticeable are the Japanese, for the people of this race make up more than one-third of the total population of the islands. In some places Hawaiian girls add to the colorful scene with sidewalk displays of wreaths and ropes of flowers ("leis").

The Pearl Harbor Naval Base

Six miles west of Honolulu is Pearl Harbor, the United States chief outpost of Pacific defense. This is one of the strongest naval bases in the world, and one of the finest landlocked harbors. It is flanked by barracks, shops, and huge dry docks for repairing warships. Once barred by a coral reef, the channel has been dredged to a depth sufficient for the largest war-

WHY HE LOOKS THAT WAY



What an ugly expression! It's because this feathered mask represents the ancient Hawaiian God of War.

ships. The harbor works are protected by coastal batteries, and the Army maintains a highly mechanized defensive force. A few miles inland is Schofield Barracks, a great army post.

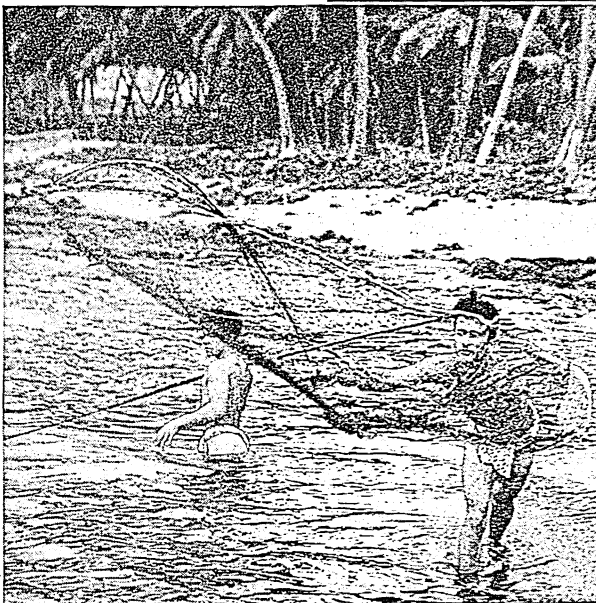
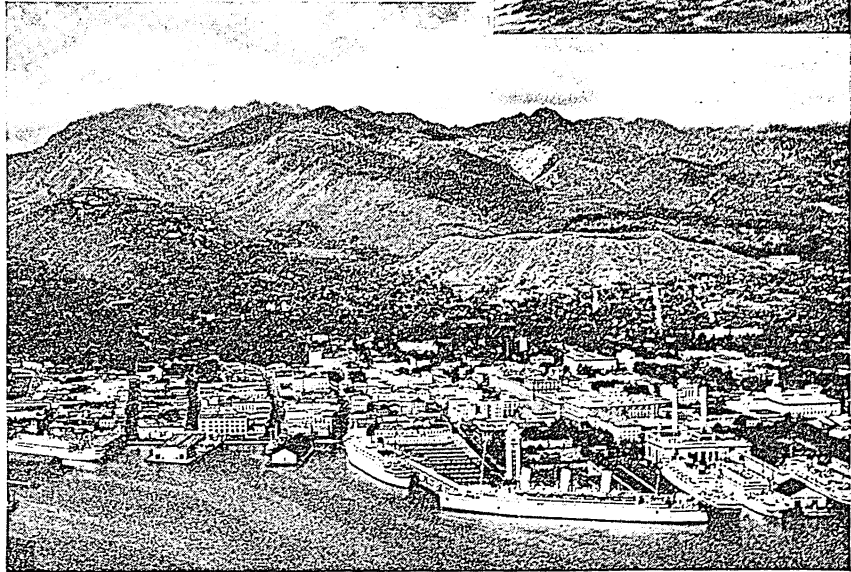
Here it was that Japan, on Dec. 7, 1941, suddenly unleashed its long-planned war against the United States with a surprise aerial and submarine attack, inflicting great damage on naval vessels, aircraft, and flying fields, and causing many casualties. It also bombed and machine-gunned other military centers on the island of Oahu, as well as Honolulu itself.

A Trip Around the Islands

The islands raise only about two-fifths of their food, since it is more profitable to devote the small crop area to export crops—pineapples, sugar, coffee—and import food from the mainland. Sugar forms more than half of the exports of the islands, which have the largest yield per acre in the world. On the more elevated lands are great fields of pineapples, which in value constitute the islands' second industry. This fruit is famed for its delicious flavor, and is exported, raw or canned, to all parts of the world. There are also fields of sisal hemp, each plant looking like a rosette of spears; and "algaroba" forests (a species of locust) where bees that supply

IN AND AROUND THE CITY OF HONOLULU

Surf-riding at 40 miles an hour on rollers a mile long is thrilling sport at the celebrated Waikiki Beach. Below is Honolulu, which lies in a luxuriant plain at the foot of volcanic mountains. A mile back from the harbor is the Punch-bowl, crater of an extinct volcano. Cruise ships are always at anchor in the harbor.

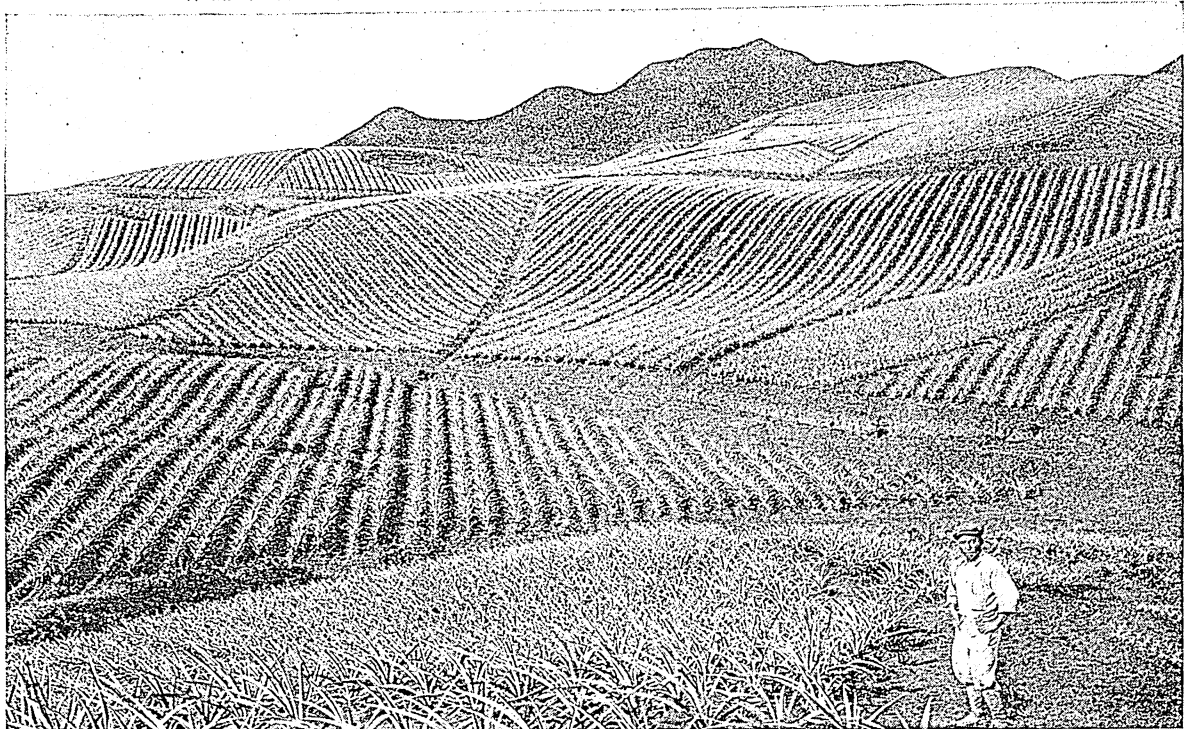


The Kanakas are skillful fishermen with net and spear. The man at the right is tossing out his net in a wide sweeping loop—a feat which requires as much adroitness as throwing a lasso.

many tons of honey are kept. Some cotton is raised. Everywhere we go we notice little "taro" patches, and often see men and women working in them, standing up to their knees in water. The beetlike root of this plant, after being baked, pounded, and mixed with water, forms a thick fermented paste called "poi," which is the principal food of the islanders.

From Oahu, the third of the islands in size but the greatest in population and wealth, a coast steamer will take you south to Hawaii, which is larger than all the other islands together. On the way you pass the island of Molokai, famous for its leper settlement on a jutting peninsula in the north, and Maui, the second island in size, with some of the most important plantations. You pass also the great pineapple plantations of Lanai and the vast cattle and horse ranches of Kahoolawe. Finally the coast of Hawaii comes into view, and you leave your ship at Hilo, the island's only large seaport and a city of brilliant charm. Beautifully situated on a broad bay, with superb mountains in the background and tropical trees and gardens throughout the town, Hilo has many attractions that compensate for its reputation of having rain "eight days in the week."

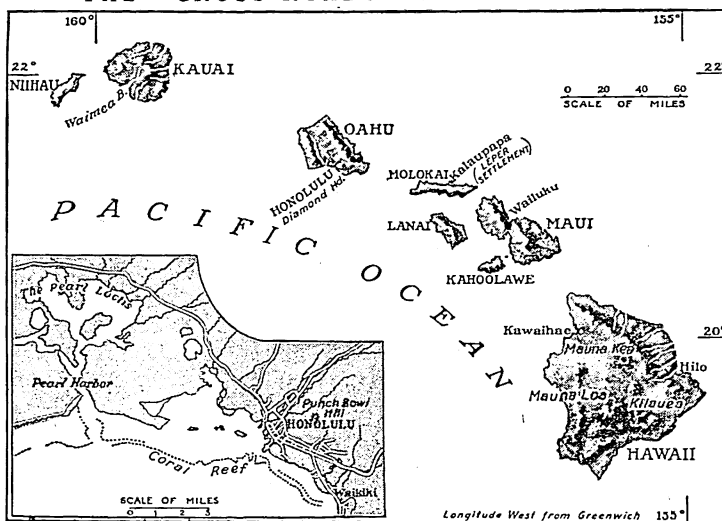
WHERE THE DELICIOUS PINEAPPLES GROW



After you have passed through the large sugar plantations on the lower slopes and in the valleys of the Hawaiian Islands, you come on the more elevated lands to these vast fields of pineapples. The pineapples of Hawaii are especially noted for their delightful flavor and are exported, raw or canned, to all parts of the world.

The entire island has much to charm the sightseer in its snow-capped mountains and tangled tropical forests, its deserts and sparkling water-falls, its lava flows, and its plantations of coffee and sugar. But its chief attractions, that bring thousands of visitors every year, are its great volcanoes—Mauna Loa, the largest active volcano in the world, and Kilauea, with its ever-seething lake of molten lava now rising to the brim, now receding far into the depths below. About a century and a half ago, in 1790, Kilauea in one of its angry moods destroyed an army marching against King Kamehameha. From that time until 1924 it remained placid, throwing out neither rocks nor ashes. Mauna Loa is far less tame, erupting every

THE "CROSS-ROADS" OF THE PACIFIC



This map shows the Hawaiian Islands stretching 400 miles across the mid-Pacific. The inset shows Honolulu, and Pearl Harbor six miles away. Formerly the coral reef was continuous, but the bar at the entrance of Pearl Harbor was removed and the harbor is now a naval station, one of the important strategic points guarding the Pacific coast of the United States.

few years. These volcanoes, with the extinct volcano of Haleakala, "House of the Sun," on Maui, make up the Hawaiian National Park. Maui has a tremendous crater 20 miles around filled with reddish cinder cones. Lofty Mauna Kea (White Mountain) on Hawaii is covered with snow many months of the year; it is a volcano, but has not erupted within the memory of man.

On the return voyage to Honolulu, you see dairy and beef cattle,

sheep, horses, mules, and hogs in the island lowlands. Deep in the turquoise blue of the bays are tropical fish, shimmering like spilled jewels. To the northwest is scenic Kauai, called the "Garden Island" because of its prosperous plantations of sugar, rice, and pineapples. Here mountain torrents have carved richly-

tinted canyons, among them the Grand Canyon of the Waimea, which has been compared with the Grand Canyon of the Colorado in the United States. Nawiliwili in the southeast has a good port; across a channel from it is Niihau, with its sheep flocks.

On Molokai is a celebrated leper colony. When the heroic Belgian priest, Father Damien (1840-1889), landed here, he "shut with his own hands the door to his sepulcher," to quote Robert Louis Stevenson. After 16 years devoted to developing sanitation, schools, industry, and religion, he died of leprosy. In this isolated colony patients receive the most modern medical treatment, and many are cured.

Of the long chain of islets stretching far to the northwest of Kauai, the most famous is Midway. This tiny group, a civil and military aviation base and a cable station, will long be remembered for the gallant stand its few defenders made against the Japanese assault of December 1941. The entire chain is sometimes called the Bird Islands, because since 1909 it has been reserved as a bird refuge. Millions of sea birds nest on these barren sandy islets.

Work and Flowers

Sugar cane grinding and pineapple canning are the two big island industries, but coffee roasting, fish and

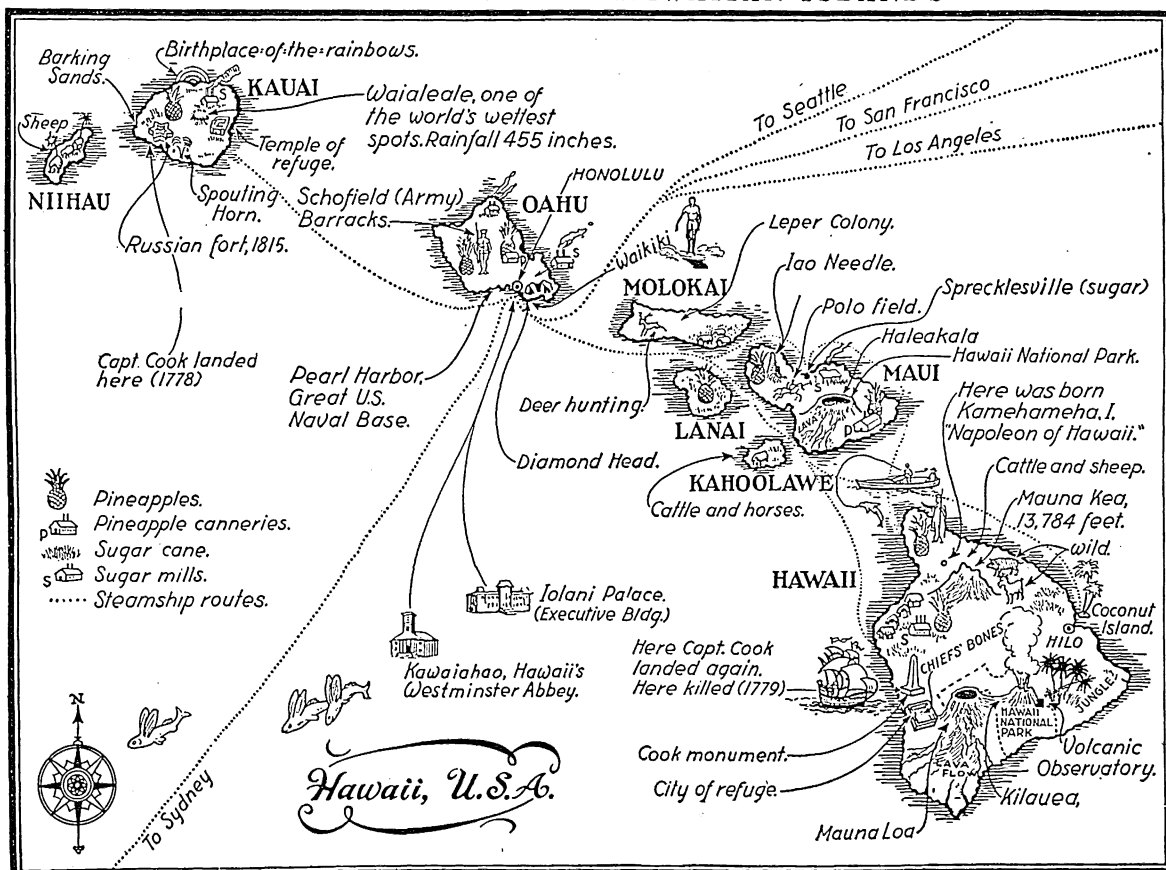
meat packing, and the manufacture of iron and steel, sugar machinery, tin cans, bed-springs, mattresses, beverages, clothing, shoes, baked goods, poi, and ice cream also provide work for many hands. Lime, salt, and stone are the only minerals worked, but sulphur, gypsum, and kaolin are found in small quantities.

Many ships plowing across the Pacific from Canada, the United States, the Orient, and Australia call at the Hawaiian Islands. Messages are sent to both sides of the ocean by cable and radio. The islands themselves communicate by interisland steamer, airplane, and radio, and the larger islands have telephones and railroads. Fine highways open vistas of surf and mountain to the traveler.

Children of many colors, mingling in the Hawaiian public schools, are all taught to speak English. Vocational studies are stressed, and school attendance is compulsory. Outside of school hours, many study also in foreign-language schools, chiefly Japanese. At Honolulu is the University of Hawaii.

The crowded plant life of Hawaii boldly climbs from beach sands to the edge of lava flows. Plumed palm trees border the cloak of loveliness woven for the islands by the scarlet flame-tree, Indian pepper and spreading banyan, the yellow shower tree and purple

A MAP STORY OF THE HAWAIIAN ISLANDS



This pictorial map shows the main group of islands, their chief products, and points of scenic and historical interest. For the other islands and for distances to Pacific ports, turn to the map with the article Pacific Ocean.

SUNRISE IN THE COCONUT LAGOON



Honolulu is famous for its gorgeous sunrises and sunsets, and its wealth of tropical scenery. One of its beauty spots is the Peninsula, a coconut lagoon near the city. Here we see it at early morning.

bougainvillea, the showy hibiscus, and the long-limbed hau. Here, too, many of the ferns grow to be almost trees. Among the useful trees are the koa, sought for building and cabinetwork, and the candlenut, whose nut yields a lamp oil. Leaves of the ti, a treelike shrub, supply food wrappers, and the roots are baked and eaten. Due to isolation and highly varied environment, Hawaii has hundreds of plants which grow nowhere else in the world, such as the mamaki, a paper mulberry. Scores of useful plants have been brought in from other regions, including palms, breadfruit, the taro from which poi is made, sugar cane, pineapples, coffee, avocados, yams, bananas, and figs.

Chickens, pigs, and dogs were brought to the islands by the early Hawaiians, who found there only small bats, lizards, and birds. Goats, English hogs, cattle, sheep, horses, spotted deer, and the mongoose were later comers. In fact, even the frogs and toads were imported, and to this day there are no snakes on any of the islands. Native birds are the brown elepaio and the sweet-voiced ou; and feathered aliens include the pigeon, the mina, and the pheasant. The delicate land and fresh-water shells have taught scientists many lessons in the story of life.

Native Hawaiians Were Polynesians

In outrigger canoes, the brown Polynesian ancestors of the present native Hawaiians swept thousands of miles across the sea, probably from Samoa, and landed

on the islands about 500 A.D. Tahitians and other islanders followed them 500 years later. These latter, handsome, athletic people, excelled as sailors, fishermen, and swimmers. Chiefs and priests were powerful, and the religion was harsh, with severe tabus and human sacrifice. Royalty were incredibly gorgeous feather cloaks; one of them, now in the Bishop Museum at Honolulu, is valued at \$1,000,000. This red and yellow mantle was 100 years in the making, since only the feathers under the wings of the mamo, a rare bird now extinct, were plucked for it. From the bark of the paper mulberry tree, Hawaiians wove a cloth called *tapa* which they decorated and made into skirts and mantles.

They are vanishing fast, these softly smiling Hawaiians. Disease and

intermarriage have so reduced their numbers that now Hawaiians and part-Hawaiians make up only about 15 per cent of the total population. But still their sighing, tender music haunts the islands. Do you not know it, played on the guitar or ukulele? 'Aloha Oe' (Farewell to Thee), written by Queen Liliuokalani, sings greeting and farewell to every ship in Honolulu harbor. Even the Hawaiian language itself is musical. The famous hula dance acts out a folk-tale or historical event. The hula girl in her swishing grass skirt moves her hips as she tells her story with shoulders and hands working graceful patterns to the rhythm of a guitar or a gourd drum. No less graceful are the Hawaiian surf-board riders, who swim far out and toboggan back on the long rolling waves, balancing themselves with amazing skill. Fishermen dive down and swiftly spear their catch under water. Natives often cannot work for several days after an old-fashioned feast or *luau*; they partake too freely of chicken cooked in coconut milk, and of pig roasted whole with crabs, yams, and bananas in a sand-pit full of hot stones. Instead of the grass huts of old, the Hawaiians, or Kanakas, live now in wooden houses, and some have fine homes.

The thousands of alien people who now fill the Hawaiian Islands came by invitation to work in the sugar fields. As the first-comers found better jobs, new immigrants arrived to fill the vacant places in the

fields. Chinese came first, then Portuguese, next the Japanese, then Koreans, Spaniards, Puerto Ricans, and, lastly, Filipinos. Nearly half of the total population of the islands belong to the yellow race; about a fourth are white (Caucasian); and approximately a fourth are brown. English is the prevailing language. All Hawaiian citizens possess the rights of United States citizenship and children born in Hawaii are citizens, even if their parents are Orientals and thus excluded from citizenship by federal law.

Natives Kill Captain Cook

When Capt. James Cook landed on Kauai in 1778, the people thought him and his crew supernatural beings and sent messengers in the swiftest canoes from end to end of the island with word of the strange visitors. The next year Captain Cook was slain by natives while he was attempting to recover a stolen boat. (See Cook, Captain James.)

Cook called the islands the "Sandwich Islands" after his patron, John Montague, the fourth Earl of Sandwich, and head of the British Admiralty Office; but "Hawaii," the name used by the natives, is the one by which they are now known. Although not the first white man to visit the islands, Captain Cook's famous journals first made their geography known to the civilized world. The islands were then governed by chiefs who constantly waged war against one another. Shortly afterward (1795) they were all united under the famous King Kamehameha I, whose descendants reigned for almost 100 years. Many missionaries came to the islands from America and Europe, the first being sent from

Boston in 1820, and through their efforts the people were taught reading and writing in mission schools, and converted to Christianity.

Annexation to the United States

In 1893, when Queen Liliuokalani attempted to abolish the constitution which King Kamehameha III had been forced to give the people, a revolution took place. The Queen was deposed, and the new government applied for annexation to the United States. President Cleveland, however, withdrew the annexation treaty from the Senate when he took office, on the ground that the United States diplomatic representative, backed by marines landed from a naval vessel, had improperly aided the revolution. Hawaii was then organized as a republic, in 1894, with Sanford B. Dole as president. Four years later, during the Spanish-

American War when the Republican party was again in power with President McKinley, an annexation treaty was concluded.

The islands now form the Territory of Hawaii, with a governor and a secretary appointed by the president of the United States, a territorial legislature, and a delegate who represents the territory in the United States Congress, but has no vote.

HAWK. Until recently all hawks had the ill will of every farmer and sportsman because of the havoc which some members of this large group work among poultry and other birds, but careful study has shown that all but three species do more good than harm, by destroying enormous numbers of small rodents and insects that are harmful to grain, fruit trees, and birds. The true bird-killers and the only ones that deserve the name "hen-hawks" are the sharpshin hawk, Cooper's hawk or the blue-darter, and the goshawk. These are bold marauders and do most of the mischief that is attributed to the hawk group.

Their trade is battle, murder, and sudden death, and they fully deserve the death sentence that has been passed on them. About 450 distinct species of hawk are recognized, but only 34 are found in the United States and Canada. All are day-seeking birds of prey and possess remarkable keenness of vision, great swiftness of flight, and immense clutching power. They are distinguished from the vultures by the fact that they rarely taste anything they have not themselves killed. Most of them are plainly dressed in browns and grayish whites with darker markings, and are unadorned with plumes.

They do not sing, but have a call resembling a harsh scream. According to species, they nest on the ground or in trees.

The sharpshin is the smallest of the three pernicious hawks. It is a bird about 11 inches long, bluish gray above, and white, heavily barred with brown, beneath. Although no larger than a robin this murderous little villain will destroy all the small birds in its neighborhood, from the flickers and doves to the tiny warblers. It is partial to chickens, and often exterminates whole broods.

Cooper's hawk, which is about one-third larger than the sharpshin, is even more fierce and destructive. It will snatch a young chicken from before the eyes of the farmer. It not only carries off good-sized fowls but even grouse and rabbits.

FATHER HAWK ON GUARD



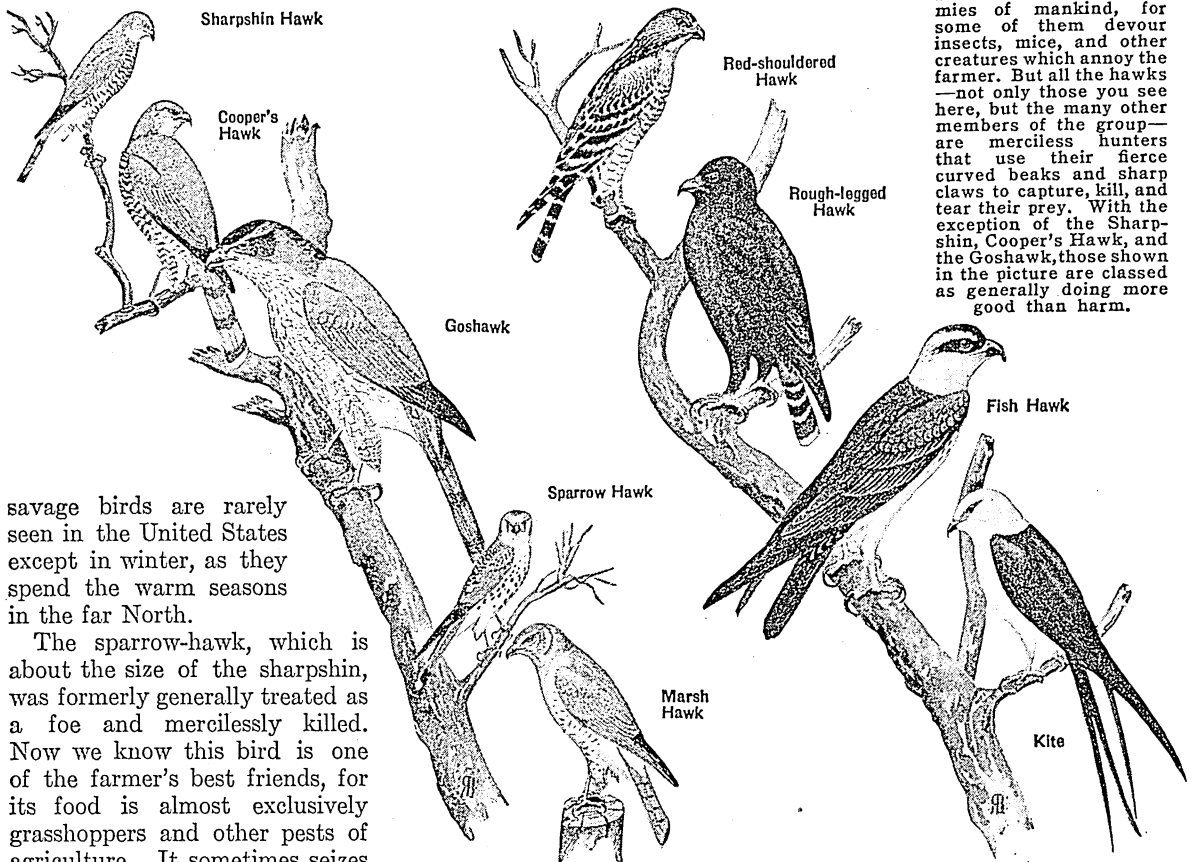
It seems that the Marsh-Hawks feel perfectly able to defend their homes, for they build nests on the ground without much attempt at concealment. The male hawk helps in the building and in feeding the babies. Here the male is shown guarding the eggs. Even young hawks in the nest will fight if you attempt to touch them.

The goshawk is twice the size of the sharpshin and is the boldest and most destructive of all. This bird has been known to snatch a wounded game-bird from beneath the feet of the hunter. The young goshawk, which is even bolder than its elders, is sometimes confused with the harmless red-tailed hawk, because of its brownish plumage. Fortunately these

tions are inconsiderable. This falcon was reserved exclusively for the use of earls, while only royalty could hunt with the great gerfalcon. (For illustration in colors of sparrow-hawk, *see* Birds.)

Nearly all of the buzzard-hawks are valuable allies to the farmer and sportsman, although they have been made to suffer for the sins of their buccaneering

A GROUP OF FIERCE AIR PIRATES



Not all hawks are enemies of mankind, for some of them devour insects, mice, and other creatures which annoy the farmer. But all the hawks—not only those you see here, but the many other members of the group—are merciless hunters that use their fierce curved beaks and sharp claws to capture, kill, and tear their prey. With the exception of the Sharpshin, Cooper's Hawk, and the Goshawk, those shown in the picture are classed as generally doing more good than harm.

savage birds are rarely seen in the United States except in winter, as they spend the warm seasons in the far North.

The sparrow-hawk, which is about the size of the sharpshin, was formerly generally treated as a foe and mercilessly killed. Now we know this bird is one of the farmer's best friends, for its food is almost exclusively grasshoppers and other pests of agriculture. It sometimes seizes small chickens to feed its young, but the damage it does is nothing in comparison with its services.

The sparrow-hawk is one of the varieties properly classed as *falcons*. These are distinguished from other hawks by having the beak hooked at the point, with a notch or tooth on the cutting edge of the upper mandible. They are the most perfectly developed of all birds, remarkable for their strength, symmetry, and powers of flight, and were the birds chiefly employed in the sport of falconry, which was one of the most popular amusements of the Middle Ages. With "hooded" falcons on their gloved wrists, the hunters would sally forth in search of game birds. When the "quarry" was sighted, the falcon's hood was slipped and it was thrown into the air, to dart like an arrow at the prey, plunging its talons into it and crouching over it until the hunter galloped up. The most prized falcon was the peregrine or duck-hawk, which is today so rare and shy that its depreda-

relatives. These are mostly big heavy slow-flying birds, with long broad wings and a broad tail, while the falcons have shorter tails and long, pointed wings. Among the most serviceable varieties that should be carefully protected are the marsh-hawks, which are said to destroy an average of 500 field mice apiece during the nesting season; the red-shouldered and the red-tailed hawks, often unjustly called chicken-hawks; and the rough-legged hawks, which are feathered down to the toes and come to the United States in winter to range the fields in search of mice. Some of these friends of the farmer may occasionally seize a chicken to feed their young, but the damage is made up many times over by their services.

The fish-hawks, or ospreys, are close relatives of the hawks and falcons, but they live exclusively on fish. They are found on all the continents near the ocean or other large bodies of water. They cannot dive, as the ducks do, but catch fish by pouncing on them

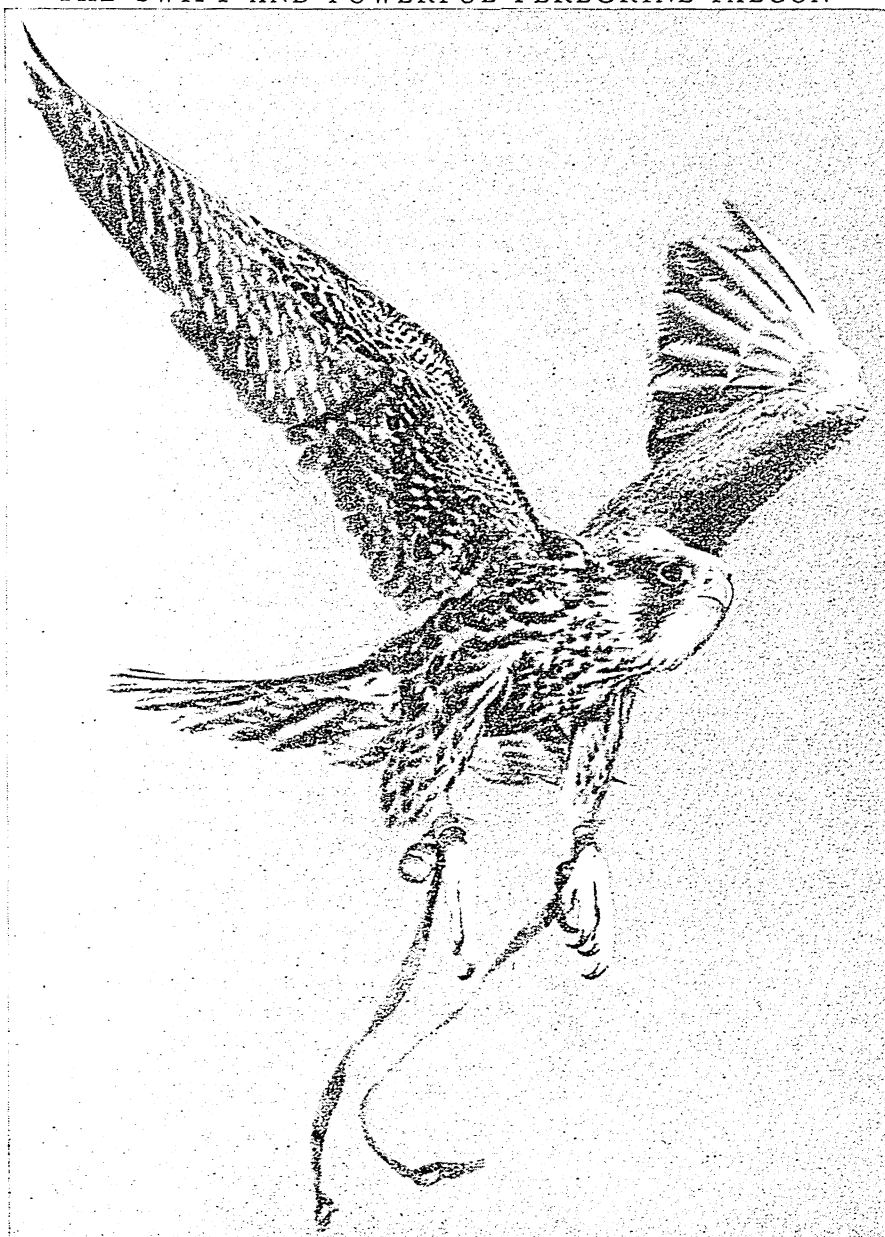
as they swim near the surface and seizing them in their talons. As they fly away they hold the fish head forward. A sea eagle, especially a bald eagle, will often rob a fish hawk of its prey by swooping down and forcing the hawk to drop the fish. The larger bird then catches it as it falls.

Kites are medium-sized birds closely related to the hawks. The swallow-tailed kites of southern United States are among the most graceful of all birds. They seem to live almost entirely in the air, soaring for hours on their long, powerful wings. They even pick up food and water while in flight. The Mississippi, Everglade, and white-tailed kites are also southern birds.

Kites, hawks, eagles, and falcons belong to the sub-order *Falcones* of the order *Falconiformes*. Scientific name of sharp-shinned hawk, *Accipiter velox velox*; marsh hawk, *Circus hudsonius*; goshawk, *Astur atricapillus*; swallow-tailed kite, *Elanoides forficatus forficatus*; osprey, *Pandion haliaetus carolinensis*; sparrow hawk, *Falco sparverius*; peregrine falcon or duck hawk, *Falco peregrinus*.

HAWKINS, SIR JOHN (1532-1595). Among the bold and ruthless seamen of Elizabethan England, none gained a greater reputation for reckless daring than John Hawkins. He was the first to defy Spain's power in the West Indies, the first to open to his country the commerce of the New World. He was born in Plymouth in 1532, the son of a sea captain and wealthy shipowner. On several trading trips to Spain, Portugal, and the Canary Islands, the young Hawkins heard fascinating tales of the riches that lay across the Western Sea. He determined to share in them without caring much how he went about it. He learned that the Spanish were in desperate need of Negro slaves, so in 1562 Hawkins sailed for the coast of Africa, where he

THE SWIFT AND POWERFUL PEREGRINE FALCON



The tremendous speed, strength, and daring of the peregrine falcon or duck hawk make it a favorite for training in the sport of falconry. This high-speed photograph by Gjon Mili shows a bird just "taking off" from the falconer's wrist. Attached to the legs are straps called "jesses," which serve the same purpose as a dog's leash. The bells help to locate the bird wherever it may alight. Peregrine falcons have a cruising speed of 60 miles an hour, and they dive on their victims at more than 150 miles an hour. They feed chiefly on shore birds and waterfowl.

acquired 300 Negroes "by the sword and other means." Then he set forth for Santo Domingo to trade his cargo for pearls, hides, ginger, and sugar. When the Spanish officials objected to breaking the laws against trading with a foreign nation, he persuaded them by force of arms to meet his terms. Two more expeditions followed. The third voyage (1567-69) was disastrous. He had entered the harbor of Vera Cruz, the port of Mexico. Suddenly the Spanish fleet arrived,

bearing a new Mexican viceroy. Hawkins was attacked and only two of his vessels escaped. One was commanded by himself; the other, by his young kinsman Francis Drake. (See Drake, Sir Francis.)

For the next 20 years he remained at home in the service of Queen Elizabeth, building up her navy in anticipation of the coming conflict with Spain for supremacy of the seas. As treasurer and comptroller of the navy he managed and maintained the whole naval force of the nation. He redesigned vessels and introduced many of his own inventions, worked out in practical experience at sea. In the great battle in which the Spanish Armada was defeated (1588) Hawkins served as a vice admiral and was knighted for gallantry.

In 1595 he sailed with Drake on what was to be the last voyage for both men. Old and sick he joined the expedition to attempt the rescue of his only son Richard, who was a captive of the Spanish at Lima, Peru. He died off the coast of Puerto Rico.

HAWTHORN. The white glory of the English countryside when the hawthorn bursts into bloom has inspired the song of many a poet. The English tree has been introduced into the United States, but the many native American species are no less beautiful.

Hawthorns are low, shrubby, thorny trees, seldom more than 25 feet tall. They are favorites for hedges and ornamental plantings in gardens, where they do best in sunny locations and in limestone soil enriched with loam. In the spring they are masses of white, pink, or crimson blossoms, which show the close relationship of the hawthorns to the rose family. The flowers are followed by red fruit, like miniature apples, known as "haws" or "thorn apples." The fruit of some of the more southerly species may be made into jellies and preserves. The wood is very hard and is valuable for making mallet and hammer handles and other implements. The English often call the hawthorn the "may tree," and use the flowering branches for May Day decorations.

The hawthorns are widely distributed through the temperate regions of the Northern Hemisphere. In North America alone there are more than 900 species; Europe has about 60 species. The name of the genus *Crataegus* comes from the Greek word *kratos*, meaning "strength," referring to the hard wood. Scientific name of the English hawthorn, *Crataegus oxyacantha*; the red haw, or scarlet haw of southern Canada and northern United States, is *Crataegus intricata*. The state flower of Missouri is *Crataegus mollis*. The so-called "black haw" is the sweet viburnum of the honeysuckle family.

NATHANIEL HAWTHORNE AT 46



This photograph of Hawthorne was made in 1850, the year the 'Scarlet Letter' was published. He was a man of medium height and slight but athletic build. His hair was almost black, his eyes dark blue and astonishingly brilliant.

HAWTHORNE, NATHANIEL (1804-1864). "Hawthorne," says an American critic, "is without doubt the most perfect workman of all American men of letters." No one questions his right to the title of a genius. He was a true artist who took time and pains to make his language the fitting expression of his thought. Finely sensitive to beauty, his style is delicate, simple, and pure. He had also a gift of penetrating insight into human hearts.

A native of Salem, Mass., he was a true New Englander, his ancestors having come to the New World in 1630. Born and bred in Puritanism, steeped in its legends and tradition, Hawthorne interpreted the Puritan spirit as no one else did. His greatest book, 'The Scarlet Letter', is the story of sin and punishment and repentance in old Salem. 'The House of the Seven Gables' was somewhat like the home of his own childhood—solitary, gloomy, haunted by an ancestral curse.

His father, a sea captain, died when the boy was four years old. His grief-stricken mother retired into a lonely world of her own. She did not even take her meals with her son and two little daughters. When Nathaniel was nine years old he broke his foot, and for nearly two years was confined to the house with only his books and his sisters for companionship. The brooding, mirthless home turned his thoughts inward. He developed a shyness and reserve that he never overcame. A year in the forested wilderness of Sebago Lake, Me., when he was 14, gave him an intimate appreciation of nature and increased his love of solitude. He attended Bowdoin College from 1821 to 1825.

After Hawthorne left college he returned to Salem, where he lived almost like a hermit until he was 33. Though he published little, this long quiet time of preparation doubtless accounts for his depth of thought and perfection of style, for there is never anything crude or immature about his writing.

For a time Hawthorne lived at Brook Farm, where a group of literary men and women were trying an experiment in communal life, and from this he got the idea for his 'Blithedale Romance'. He married Miss Sophia Peabody in 1842 and for a time they lived in Concord, Mass., in the "Old Manse," in intimate friendship with Thoreau, Emerson, and Margaret Fuller. Then, because he could not earn enough by writing to support his family, he took a position in the Salem custom house. Under the

influence of the old atmosphere that had so strongly touched his imagination, his thoughts began to take definite shape in the story that made him famous, 'The Scarlet Letter' (1850). After it was published, as he said, "fame was won," and his future was secure.

When Franklin Pierce became president he sent his old classmate as consul to England, so Hawthorne had a chance for European travel, visiting also France and Italy. Broken by ill health and saddened by the Civil War, he did not live many years after his return in 1860. The 'Dolliver Romance' he had never finished, and the manuscript was buried with him.

None of Hawthorne's novels could be called bright and cheerful, though they have touches of quiet humor. They are overhung with a sense of mystery and unseen influences. One of his favorite themes is sin and its growth, repentance and atonement—truly Puritan subjects. Many of his tales are symbols or allegories—such as 'The Great Stone Face'. On his stories for children he put the same care and thought as on his novels for older folk.

Hawthorne's principal works were: *Novels*—'The Scarlet Letter' (1850); 'The House of the Seven Gables' (1851); 'The Blithedale Romance' (1852); 'The Marble Faun' (1860). *Sketches and Tales*—'Twice-Told Tales' (1837); 'Mosses from an Old Manse' (1846); 'Our Old Home' (1863). *Books and Stories for Children*—'Grandfather's Chair' (1841); 'A Wonder Book for Boys and Girls' (1851); 'The Snow Image and Other Tales' (1851); 'Tanglewood Tales' (1852).

HAY. "Hay, good hay, hath no fellow," says Bottom in 'Midsummer Night's Dream' while crowned with his ass' head; and he is certainly right from the standpoint of feeding farm animals, especially for use during the months when the pastures are brown and dead. In the United States the annual hay-crop is exceeded in value only by corn, wheat, and cotton. To produce the grand total of 100,000,000 tons, which is the approximate amount used annually in the United States, legumes such as clover, alfalfa, and cowpeas, grasses such as timothy, meadow grass, and brome grass, and even the cereal grains, rye, oats, and barley, are cut as fodder. The pasture-lands are covered almost entirely by native grasses, but the great bulk of the hay crop is furnished by these plants brought from foreign fields.

In order to keep a large portion of the sugars and other soluble matter stored in stalk and leaves by the growing plant, most hays are cut while the grass is still in flower and before the seed matures. If left standing too long, the stems and leaves rapidly lose their nourishment, becoming dry and useless for feed. Sometimes two or more crops may be obtained from the hayfield in a year. It is usually cut and left on the field about three days to dry or "cure" in the sun. When properly done, curing develops a desirable flavor and the characteristic aroma which makes the meadows "sweet with hay." To prevent it from drying too rapidly and to protect it from rain, it is raked into windrows or put up in cocks. About a week after cutting it is loaded in hay racks and hauled to the barn or stack. Hay tedders, hay rakes, and

hay loaders greatly lessen the work and hay presses have come into quite general use to bale the hay because the bulkiness of the loose hay is a great disadvantage in storage or transportation.

The chief hay-producing states are New York, California, Wisconsin, Pennsylvania, and Iowa.

HAYDN, FRANZ JOSEPH (1732-1809). The nickname "Papa Haydn," by which this great musician was familiarly known expresses the great affection in which he was held by all who knew him. He was a real father to his associates, as he was to all young and struggling men of talent.

Haydn's father, a mechanic of the town of Rohrau, in lower Austria, was a man of refined tastes. He was fond of music, and the evenings of Haydn's early childhood were spent listening to his father play the harp while his mother sang the folksongs of Hungary, the themes of which later found their way into some of the finest compositions of the master. The child showed marked ability along musical lines, and at the age of eight was made a chorister in the chapel of St. Stephen, in Vienna. Here for nine years he sang and studied, but at the age of 17 his voice broke. Because of some boyish prank, he was expelled from the school and found himself penniless in the streets. Ten long hard years followed. Hungry, cold, ragged, but always devoted to the art of music, Haydn struggled against poverty, and at last fortune smiled. He was made director of the orchestra of Prince Esterhazy, at that time the finest in Austria, and for 30 years he held this position. During this time his compositions were most numerous, and his fame as a composer spread to Leipzig, Paris, and even London.

The friendship which sprang up at this period between Haydn and the great Mozart was one of great moment for both the composers. Mozart was so frank in his recognition of the elder man's work that he said he never heard one of Haydn's compositions without learning something from it, and called him "the greatest composer in the world." Haydn profited no less from the association, for it was from Mozart that he derived much of the mastery of orchestral effect that marks his later symphonies.

When 58 years of age Haydn visited England. He was received with the greatest enthusiasm, and Oxford University conferred on him the degree of Doctor of Music. During his stay of 18 months he produced his opera 'Orfeo', nine symphonies, and numerous other compositions, among them the accompaniments of more than 100 Scotch songs.

In his 66th year Haydn's great oratorio 'The Creation' was produced. Among the compositions of his declining years was the Austrian national anthem. He died in Vienna, during the French occupation of that city, and many French officers were among the mourners at his funeral.

Haydn's compositions are numerous, including 125 symphonies, 76 quartets (which are the most distinctive of his works), three oratorios, 54 sonatas, 16 masses, and many smaller pieces for the church.

PRESIDENT HAYES, *Valiant Fighter in War and Peace*

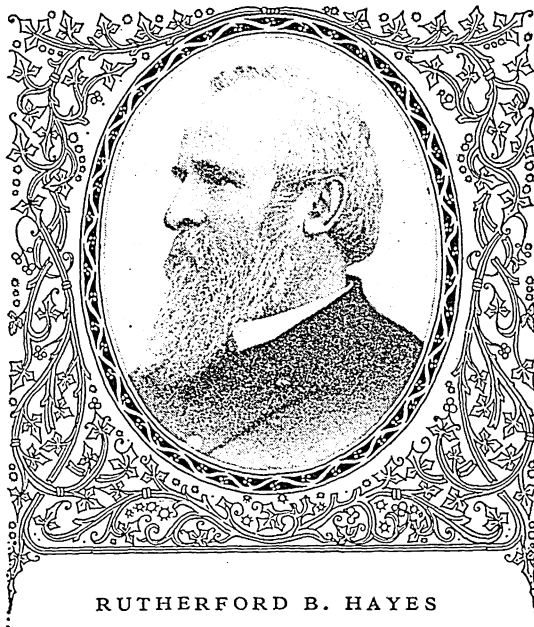
HAYES, RUTHERFORD BIRCHARD (1822-1893). "The name of Hayes began by valor," wrote a member of the Hayes family in the 17th century, and the family tradition was worthily carried on by Rutherford B. Hayes, the 19th president of the United States. On the battle-fields of the Civil War, and equally in the White House at Washington, he displayed conspicuous bravery in overcoming difficulties and in fighting against great odds.

Hayes' administration is especially noteworthy for being ushered in by a dispute concerning the presidential election which was so bitterly contested that civil war loomed as a possibility. This was the only time in the history of the country that such a danger threatened, except when war actually came with Lincoln's administration. Hayes' term of office was also marked by the ending of the Reconstruction Period in the South through the withdrawal of federal troops, by the resumption of specie payments, and by the passage of the Bland-Allison silver act.

Rutherford B. Hayes was born in Delaware, Ohio, Oct. 4, 1822, and received a good education, which enabled him to fill well all the positions in which he was placed. In 1842 he was graduated from Kenyon College (Gambier, Ohio) as valedictorian of his class; and after three years more of study, in the law school of Harvard University, he was admitted to the bar of the State of Ohio. To the end of his life Hayes maintained his interest in education. When he was in Congress he worked to improve the Library of Congress; and after he retired from the presidency he served on the board of trustees of Ohio Wesleyan University, and of the Ohio State University. He was also a member of the board of trustees of the John F. Slater Fund for the promotion of industrial education among the negroes, and of the Peabody Education Fund for the promotion of education in the South.

His Service in the Civil War

Hayes' early interest in the negro was displayed when he cast his first vote for Henry Clay, in 1844, as an anti-slavery Whig. To this party he adhered until the formation of the Republican party, in 1856. When the Civil War broke out, following the Republican triumph in the election of Lincoln in 1860, Hayes immediately volunteered for military service,



RUTHERFORD B. HAYES

and was elected captain of a regiment which was raised by the literary club to which he belonged. He declined at this time a commission as colonel which President Lincoln sent him, but later accepted a major's commission. His courage on the battle-field was conspicuous, as was proved by several wounds received in notable engagements and his conduct in the battle of Winchester (Sept. 19, 1864), where he led his brigade through a deep slough in the face of the enemy. This gallant action won for him the admiration of his men, and the rank of brigadier-general. He was promoted later to

the rank of major-general.

While he was still in the field (August 1864) he was nominated for Congress from his home district in Ohio. A friend urged him to apply for leave of absence that he might campaign for the position, but Hayes refused, saying: "An officer fit for duty who, at this crisis, would abandon his post to electioneer for a seat in Congress ought to be scalped." Without any effort on his part he was elected and served with ability. In 1866 he was re-elected, and before his second term had expired, he resigned to become governor of Ohio. Three times he was called upon to act as governor of that state. The last time that he was elected (in 1875) he stood on a platform calling for "sound money," in opposition to the Democratic policy of indefinitely postponing the resumption of specie payments and the policy of paper money.

The Famous Hayes-Tilden Election Dispute

It was Governor Hayes' position on this question that won for him the Republican nomination for the presidency in 1876 over James G. Blaine, with William A. Wheeler of New York as vice-presidential candidate. The Democratic candidate for president was Samuel J. Tilden of New York, who was also supported by many reform Republicans. Three states—Louisiana, Florida, and South Carolina—each sent in two sets of returns, one for Hayes by the "carpet bag" government, the other for Tilden, by governments set up by ex-Confederates. Both parties charged frauds on the part of their opponents. The Senate was Republican and the House Democratic, so the decision as to the disputed votes was left to an Electoral Commission, composed of five senators, five representatives, and

five justices of the Supreme Court. The decision—by a party vote of eight to seven on every question—favored the Republicans; and Hayes was declared elected by 185 electoral votes to 184 for Tilden. Party feeling ran high, and some hot-heads urged the Democrats to take the government by force; but President Grant placed troops where they might be used if needed, and the inauguration took place peacefully. The United States passed out of the period of the Civil War and into an era of prosperity, business development, national aspiration, and class controversy. Hayes' right to be president was criticized, many Democrats asserting that the Republicans had stolen the office. An investigating committee of the House of Representatives declared that Tilden was rightfully elected, but a Republican Senate committee found evidence of a Democratic plan to bribe election officials in two of the Southern states. Evidently both parties had soiled hands, and the attacks on Hayes' integrity fell flat.

Most of the men Hayes chose for his cabinet were of exceptional quality. William M. Evarts, the secretary of state, was one of the greatest lawyers in the country. He had been President Johnson's chief counsel in the impeachment proceedings, served (1868-69) as attorney-general of the United States, represented the United States before the Geneva Court of Arbitration, and was chief counsel for the Republicans before the Hayes-Tilden electoral commission. John Sherman, secretary of the treasury, had entered public life as an opponent of the Kansas-Nebraska Act, served as a member of the House of Representatives (1855-61), then served as senator from Ohio (1861-77). He was for ten years chairman of the Senate committee on finance, and the act providing for resumption of specie payments was largely his work.

A third important man in the cabinet was Carl Schurz, secretary of the interior. Schurz was a notable example of the opportunity offered by the United States to refugees from Europe. Born in Germany, highly educated, and a skilled musician, he was forced out of Germany as a result of his activities in the German revolutionary movement of 1848. He was only 23 when he emigrated to the United States, but by the time he was 30 he was one of the leading citizens of

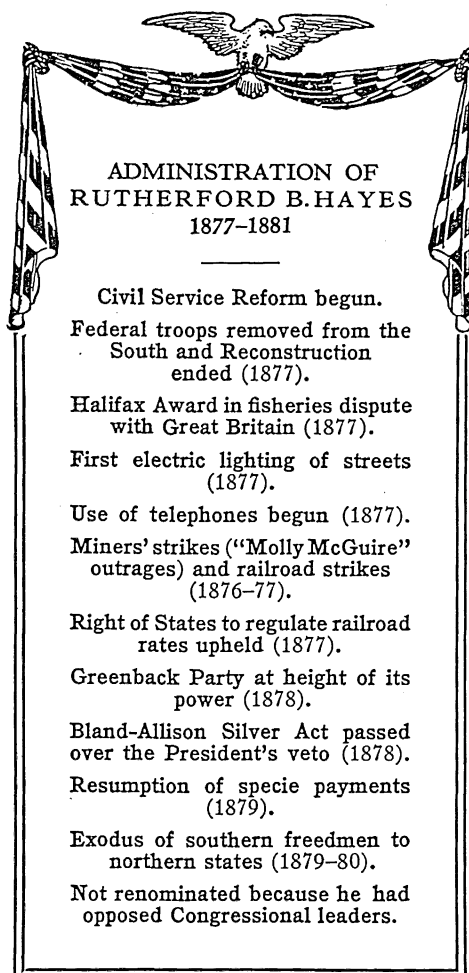
Wisconsin. As a convinced liberal he early joined the Republican party, made campaign speeches both in English and in German, and more than any other one man helped to draw Germans into the new Republican party. In 1861 Lincoln made him minister to Spain, but he resigned after a year to become a brigadier-general (later promoted to major-general) in the Union army. After the war he edited a daily paper, first in Detroit and later in St. Louis. In 1869 he was elected to the Senate from Missouri, and he soon became one of the most active of the reformers opposing President Grant. As secretary of the interior he made special efforts to help the Indians and to place the civil service on a merit basis. For the rest of his life (he died in New York City in 1906) he was probably the most prominent German-American citizen.

End of "Carpet Bag" Rule

Whether Hayes or Tilden was elected, the Civil War was over, for both candidates had made up their minds to remove the United States troops from the South, and to leave to the Southern people the working out of their own future. The "carpet bag" politicians among Republicans objected to this, and attacked Hayes bitterly for deserting them. His administration was full of controversy, with radical Republicans attacking his party loyalty, and with Democrats always in con-

trol of one or the other house of Congress, and obstructing measures of government. Once Congress even adjourned without voting money to pay the army, and private bankers had to lend the money with which to pay the troops.

But the South started on a new era, with railroads rebuilding, and with new factories manufacturing much of its cotton into cloth. The white people of the backward areas of the South found employment in these factories. Some of the freed negroes moved North hunting better jobs, and for a while the South feared that its labor supply would disappear. Many negroes were helped to independence by new ventures in education, of which the school at Tuskegee, Ala., directed by Booker T. Washington, was most notable. Booker T. Washington taught his race to be frugal and industrious, and not to worry too much about their political rights and privileges.



Prosperity came back to the United States in the administration of Hayes, but before it was well established the government had to decide whether financial

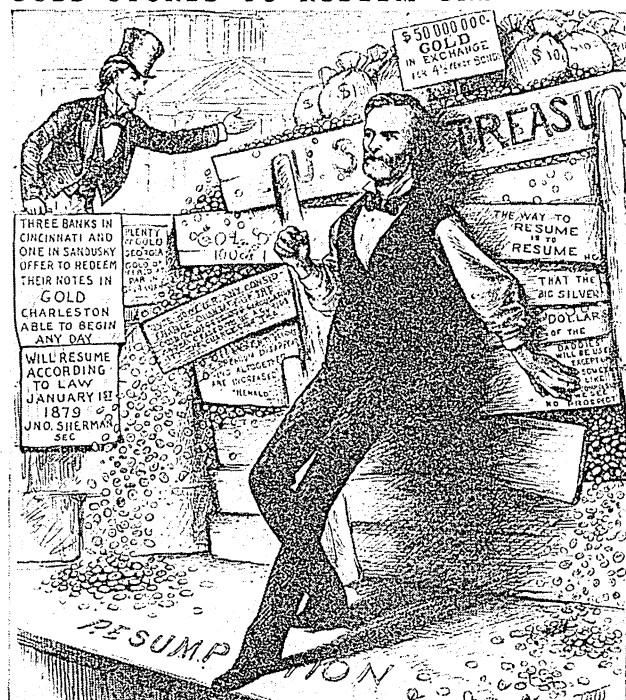
resumption of specie payments; some wanted it abandoned and yet more paper money issued by the government, so as to lessen its value and make prices high. Some even wanted to pay the whole national debt in "fiat" money. The panic of 1873 increased the number of those whose burden of debts made it hard for them to face a fall in prices.

In the Middle West a Greenback party soon appeared, and there was a Greenback candidate (Peter Cooper) for the presidency in 1876. Hayes was devoted to sound money, and to resumption at as early a date as possible, and prevented Congress from repealing the law fixing January 1879 as the date for this. His secretary of the treasury, John Sherman, began to gather gold in the Treasury to redeem the greenbacks. The movement to prevent resumption had some support from labor while the depression lasted and there was much unemployment. In 1878 the Greenback-Labor party elected 14 congressmen.

The Bland-Allison Act

In the same year the opponents of resumption added to the amount of cheap money in circulation by passing, over the veto of Hayes, the Bland-Allison Act. It directed the United States to buy each month at least \$2,000,000 worth of silver, and to coin it into standard silver dollars 16 times as heavy as the gold dollar. Owners of silver mines in the West supported this, as did the Greenbackers, because the silver dollars (whose bullion value was about 90 cents) would provide more and cheaper money. But in spite of all obstruction Hayes carried out resumption, and the United States redeemed in good faith its promise to pay the greenbacks in coin. Never since 1879 has its credit weakened. Its refusal to make shifty evasions

GOLD STORED TO REDEEM GREENBACKS



This 1878 cartoon pictures John Sherman, secretary of the treasury and author of the Resumption Act, guarding the gold accumulated to redeem the paper currency (greenbacks) in circulation.

policy was to be directed to secure the credit and welfare of the whole country, or to give advantage to a single class. Ever since the Civil War prices had been declining. From 1862, when legal-tender greenbacks first appeared, until 1879, when the Treasury was able to redeem them in gold, all prices were "paper" prices.

Paying Debts with High-Priced Money

In 1864, when it looked as though the South might win, paper prices were very high, nearly three times their pre-war average. But as confidence in the ability of the government to resume the payment of gold increased, the value of greenbacks increased. This means that prices fell, because the better the money, the more it will buy, and the lower the price. The fall in prices after 1864 bore heavily upon all who owed money, for with every decline it took more bushels of wheat, or bales of cotton, to pay a debt. This made it hard for the farmers of the West, where heavy debts were incurred in setting up new farms, and for those of the South, where the landowners, depressed by warfare and defeat, had been obliged to borrow money to rehabilitate their plantations. Some leaders urged postponing the

THE TELEPHONE IN USE—A TRIUMPH OF THE HAYES PERIOD



This cartoon of 1877 pictures Alexander Graham Bell and points out the benefits industry derived from the introduction of his telephone. Transmitter and receiver of the first instruments were alike, you may notice.

of its obligations has made it easier for the government to borrow whatever it has needed. Those who had property were indeed helped by this action that kept the value of the dollar high; those who owed money found their burdens increased. But the United States refused to violate its obligations in order to help even a class of deserving debtors.

With national credit assured, prosperity became general after 1879. The railroads resumed building, which they had stopped in 1873, and in the cities there was construction of houses and factories to accommodate the growing industries. About this time the telephone and electric light came into use. Many new inven-

tions found a large market, lightened labor for the worker, and increased the profits of the manufacturer. Kerosene was used generally as an illuminant. The camera was popularized. The great fortunes of the railroad magnates, the manufacturers, and the bankers increased in size; and before long a problem of monopoly was raised and became of public interest.

Capital and Labor

While the foundations of this prosperity were being laid, the relations of capital and labor came to the front. American labor, certain to become class-conscious as the factories increased, awakened earlier through the influence of immigration. Many of the immigrant workers had belonged to unions at home, and some were Socialists. Some of them had been forced out of Europe for their radical ideas, and within the American body of workers they were an aggressive group. In 1877 there were violent strikes on the "trunk-line" railroads, as those lines connecting tidewater with the Mississippi Valley were called. The men struck for better wages and against the increase in the size of trains, which more powerful locomotives were now able to haul. When they struck, many were discharged. Crowds of men out of work, and of disorganized hangers-on sometimes fought with the new employees, or destroyed stations, sheds, and cars. Militia, called out to maintain order, was not able to do it. Finally, Hayes sent United States troops to the railroad centers, where by their authority, rather than by force, they produced order at once. The strikes faded out, but an organized labor movement lasted, and the old and secret Knights of Labor were soon joined by the American Federation of Labor, while local and craft unions multiplied in the period that was beginning.

In the 15 years after Hayes became president, the United States increased in prosperity, but lost much of the simplicity of life that prevailed before the Civil War. It was shifting from agriculture to industry. More people were moving to the cities, and on the farms fewer hands were producing an increasing

output, by using machinery. The farmer began to send his children to the state agricultural colleges that had been founded under the Morrill Act, and to demand more instruction and aid from the United States government—aid that came when a Department of Agriculture was created in 1889.

President Hayes, himself, when he re-

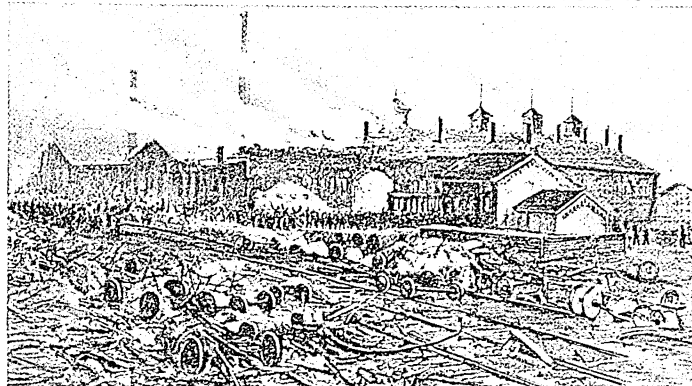
tired from office, gave freely of his time to educational work, and to philanthropic ventures like the National Prison Reform Association. He was fortunate in having enough money to let him live as he pleased, and his home, Spiegel Grove, near Fremont, Ohio, became a center of hospitality and useful influence. His old army friends and the soldiers of his command were always welcome there. He was proud of having signed, for their benefit, an Arrears of Pensions Bill that increased the allowance given to disabled veterans. No Union soldier, he said, "ought ever to be forced to choose between starvation and the poor-house." He died at Spiegel Grove, Jan. 17, 1893, after a short illness.

HAZEL. Although the hazel furnishes effective little rods for hoops and baskets and crates, it is known chiefly for its nuts. Some cultivated varieties grown in Europe, such as the filbert, are collected for the market, but the two woodland species that grow in North America are mere shrubs or bushes and the nuts have little market value. These nuts lie in leafy cups in clusters of two, three, or four, and from their light brown shade we get the color term "hazel." The oil pressed from hazelnuts is used by perfumers and painters and in medicine.

In certain European lands the forked hazel twig was once believed to be a magic divining rod that could point to the place where precious minerals or other objects lay hidden, or where water might be found by well diggers. In North America this power was ascribed to an entirely different shrub—the witch-hazel.

The hazels belong to the birch family (*Betulaceae*). Scientific name of common hazel, *Corylus avellana*; of American hazel, *Corylus americana*.

STRIKERS BURNING RAILROAD STATION AT PITTSBURGH



Industrial unrest in the Hayes administration came to a climax in the destruction of thousands of dollars worth of railroad property at Pittsburgh. The artist pictures the station burning, with wreckage of cars strewn all about. Federal troops suppressed the riots.

The GUARDIANS of *the* PUBLIC HEALTH

HEALTH DEPARTMENT. When one part of the human body suffers, the whole body is likely to be affected. In the same way if sickness or unhealthful conditions prevail anywhere in a country, all the people may be threatened. An impure water supply may start an epidemic of typhoid fever; one person with diphtheria may infect hundreds of others; chemical fumes may sap the health of the workers in an entire industry. To protect people against such dangers is the duty of the national, state, and local health departments.

Organized supervision of public health has progressed along with the advances in medical science. The movement began in the latter half of the 19th century when scientists found that most of the plagues that scourged the world were caused by germs, and could be controlled by scientific procedures (*see* Germ Theory of Disease). The first emphasis was on cleaning up the community. Among the measures undertaken were the following: sanitary sewage disposal, purification of water supplies, extermination of flies, mosquitoes, and other vermin that spread disease, quarantine against germ carriers, and inspection of milk and other foods. As a result diseases that could be controlled by environmental sanitation, such as cholera, bubonic plague, typhoid, typhus, and yellow fever, have almost disappeared from the country or, like malaria, have been greatly reduced. An outbreak of one of these diseases indicates a failure of sanitary engineering and brings public health experts to clean out the source of infection.

The Results of Preventive Medicine

One of the great allies of the public health movement has been preventive medicine, with its use of vaccines and serums to render individuals immune to many of the communicable diseases. While the person who is vaccinated thinks primarily of his own freedom from danger, his immunity is in fact a matter of public concern. It prevents him from becoming an agent in the spread of disease. Smallpox epidemics are a thing of the past because the disease can make little headway in a community where most persons have been vaccinated against it (*see* Vaccination). The spread of diphtheria has been checked by the general use of the toxoid preventive and the antitoxin cure (*see* Antitoxins and Serum Therapy).

Tuberculosis was the chief cause of death in the United States in 1900. By 1935 it had dropped to seventh place, though it is still first among young adults. Influenza is the only major epidemic disease that has resisted medical science and public health measures. But even influenza is less deadly nowadays, for sulfa drugs and serums help to cure pneumonia, which so often attacks people weakened by influenza.

New Standards of Public Health

Health departments have controlled the communicable diseases mainly by using the police powers of

government. With the aim of protecting the lives of the whole people, they place certain restraints on the freedom of individuals. They forbid a householder or a factory owner to dump waste in a stream, or they restrict the movements of persons infected with disease germs. When they attacked the problem of tuberculosis, they found that preventive methods, such as forbidding the sale of tuberculous milk, were not enough. It was necessary to educate people in hygienic ways of living, in the importance of regular physical examinations to detect the disease in its early stages, and in getting proper treatment when it was discovered.

The great success in the fight against tuberculosis encouraged public health officials to extend their research and educational programs to noncommunicable diseases such as chronic ailments and nutritional disorders. No longer is it their sole aim to protect society from the spread of infections. Their new ideal is improved personal health for every citizen. That this will lead to a stronger, more productive nation is indicated by the estimate that every day of the year some six million people in the United States are too sick to go to work.

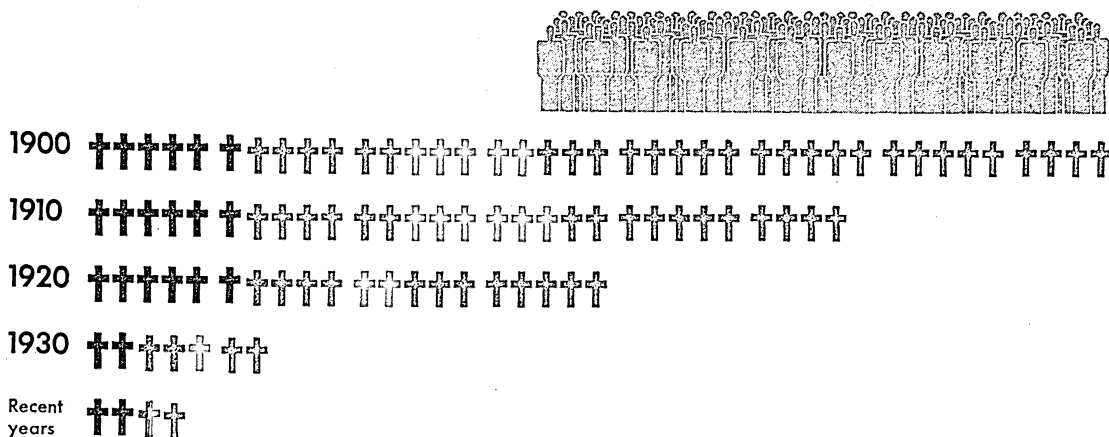
By 1938 the life expectancy of a baby born in the United States had risen to 62 years, a gain of 19 years since 1890. The average has risen because fewer people die in infancy and childhood. Maternal and child welfare programs have helped to bring this about. The presence of more old people in the population has now focused attention on diseases that attack the middle-aged and the old—cancer, diabetes, mental disorders, afflictions of the heart, kidneys, and blood vessels.

Work of Local and State Health Departments

Local departments do the greatest share of public health work, since they are closest to the people. County units and the district units that serve two or more counties have increased greatly in number and in service to rural communities since 1930. The scope of the work of city health departments has also widened enormously in this period. Their sanitary officers test the water supply and check on sewage disposal (*see* Waterworks; Sewerage). They visit restaurants, packing houses, and other places where food is handled to find out whether the equipment is clean and the employees healthy. Department veterinarians test the cows from which the city milk supply comes and examine the milk and milk-handling equipment (*see* Dairying). Inspectors follow up complaints of insanitary housing conditions, and may order that substandard buildings be demolished. Engineers examine building plans to see that they meet with sanitary ordinances. Control of smoke, fumes, and odors; inspection of summer camps and swimming pools; heating, ventilation, and sanitation in factories; local programs for control of vermin—these are also among the tasks of city health officials.

How Science Is Conquering Disease I

Infectious Diseases of Childhood in United States



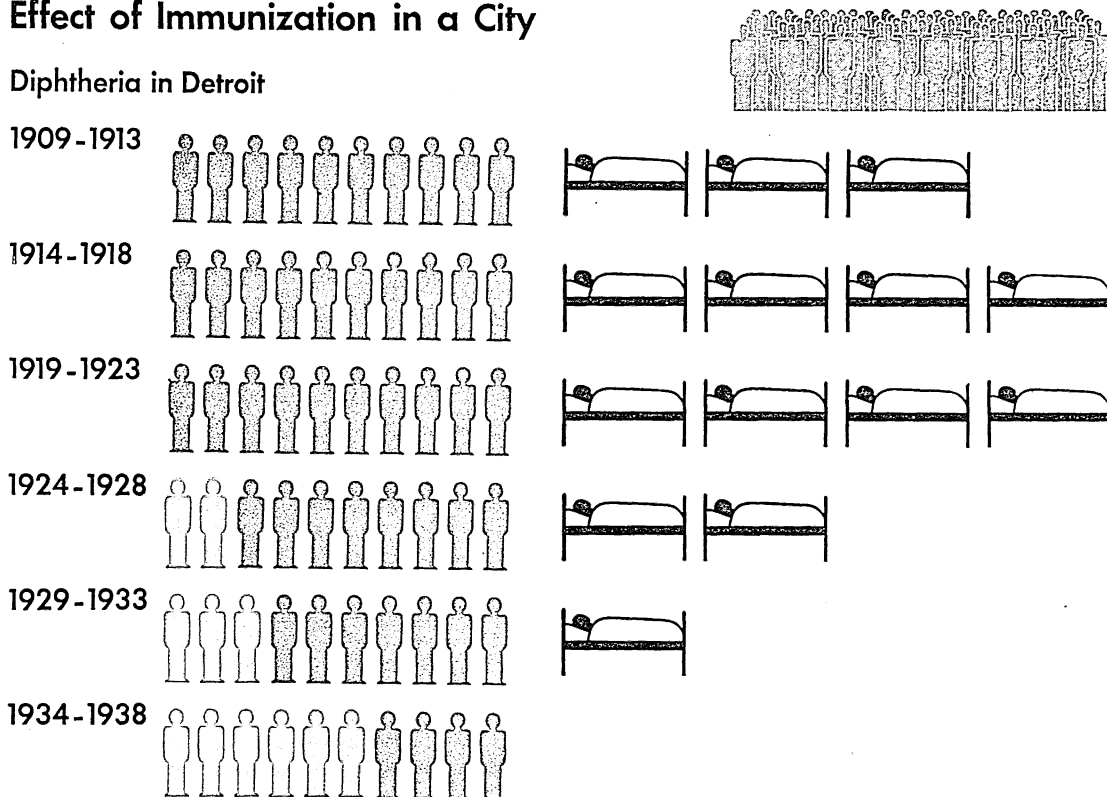
Each complete symbol represents 1 death per 50,000 population

black: from whooping cough green: from measles red: from scarlet fever blue: from diphtheria

Nowhere has medical science made greater gains than in its war against the principal communicable diseases of childhood. The untold number of lives that have been saved by modern methods of prevention and treatment is suggested by the crowded mass of figures above at the right. Deaths from diphtheria, once the most dreaded of childhood afflictions, are near the vanishing point.

Effect of Immunization in a City

Diphtheria in Detroit



Each colored symbol represents 10 % of children under five
green: not immunized red: immunized

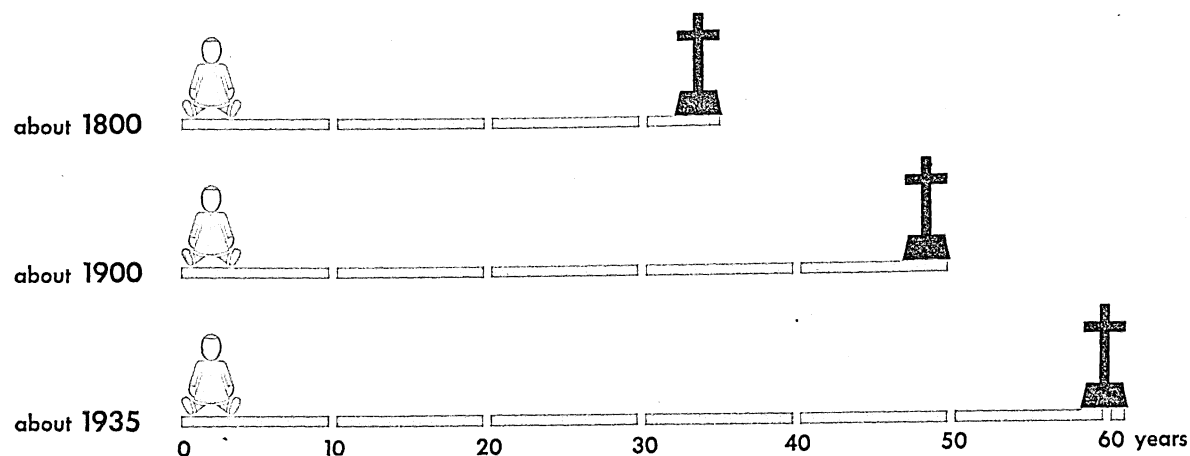
Each black symbol represents 1 case per 1000 population

Progress in the control of diphtheria is dramatically illustrated by the experience of Detroit. Before this city, in 1922, began to immunize its young children (that is, give them protective injections), it had annually three or four cases of diphtheria for every thousand of population. When it had immunized 60 per cent of its children, the rate dropped below one case per thousand.

How Science Is Conquering Disease II

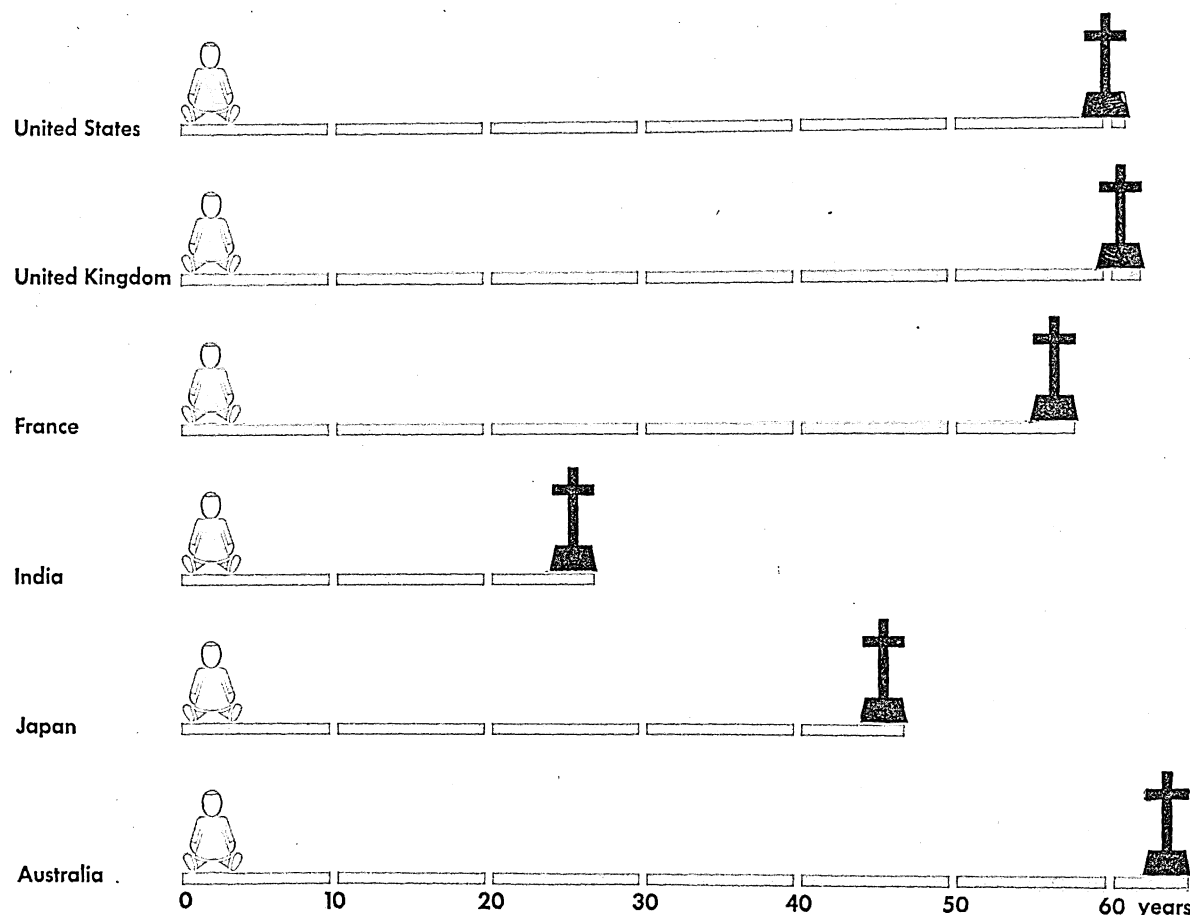
We Live Longer Than Our Forefathers

Prepared for Compton's
Pictured Encyclopedia
© International Founda-
tion for Visual Education



Were our ancestors healthier and longer-lived than we are? This chart, based on census figures for the white population, shows that they were not. We outlive them, on the average, by more than 25 years. This gain is attributed largely to increased medical knowledge, health education, and public health measures for the prevention and control of disease, especially among young children.

Life Expectancy in Various Countries



The United States is one of the most healthful countries of the world, as you can see from this chart showing the average life span in various nations. The boy or girl born in the United States can expect to live twice as long as the child born in India. Both the charts on this page are based on figures for about 1935, since later figures are not available for all the countries represented.

The medical work of city health departments is carried on by a corps of physicians, nurses, and laboratory technicians. They investigate reports of acute communicable diseases and quarantine the homes where cases are found. They maintain hospitals for segregating patients when necessary. They operate laboratories for diagnosing infectious diseases and may supply serums for their treatment. An example is the examination of dogs suspected of having rabies (hydrophobia). If the dog is found to be infected, it is killed and the department furnishes rabies serum to whatever persons it may have bitten.

Child welfare activities may include clinics or conferences where mothers go for regular examination for themselves and their babies. Nurses instruct the mothers in the proper care of infants and visit them at home to see that the instructions are being followed. Vaccination against smallpox, inoculation against diphtheria, or other treatment may be given where parents cannot afford a private physician.

Health department nurses and physicians cooperate with the schools in examining pupils for physical defects or ailments, including bad teeth or poor eyesight, as well as in giving vaccinations, inoculations, and tests of immunity.

The bureau of vital statistics keeps a registry of births and deaths. The records showing the causes of death are valuable guides to future discoveries and improvements in the field of public health.

State health departments are responsible for enforcing the health laws of the state and are usually empowered to issue such additional regulations as may be necessary to make the laws effective. They are active in education and research and they may do for the entire state any of the tasks described as part of local programs. The inspection of food dealers and processors and the enforcement of pure food and drug laws are frequently in the hands of the state department. Where water supply and sewage disposal

involve regions beyond the jurisdiction of the city, the state department takes charge.

The U. S. Public Health Service

Founded in 1798 to establish hospitals for merchant seamen, the work of the United States Public Health Service has expanded as new needs have arisen. Since states could not defend their borders against disease germs from abroad, the Public Health Service was given the task of maintaining quarantine at ports of entry. Its officers examine immigrants and inspect passengers and crews of vessels, trains, busses, and airplanes arriving from foreign countries. They guard against the landing from ships of rats and other disease-carrying vermin (*see Rat*). Reports from representatives in foreign countries give warning of epidemics that might be carried to the United States.

The Public Health Service also supervises the manufacture and sale of biological products used in medicines to insure their purity and strength. Other medicines and drugs are regulated by the Food and Drug Administration, which, like the Health Service, is part of the Federal Security Agency (*see Pure Food Laws*).

The Service operates hospitals for merchant seamen, and for other patients for whom the Federal government is responsible, including drug addicts and lepers. Its research work at the National Institute of Health and in field laboratories over the country has contributed greatly to the understanding of the causes and cures of disease. The Service also dispenses the federal money made available to state and local health authorities under the Social Security Act (*see Social Insurance*).

Other Public and Private Health Agencies

Many services related to public health are performed by branches of government other than health departments. A city department of streets may collect and dispose of garbage. A state department of welfare or of public charities may maintain tuberculosis sanitariums. The department of labor may inspect factories to enforce hygienic working conditions. Independent examining boards may examine and license physicians, dentists, druggists, and nurses.

Privately supported agencies also carry on public health work. The Red Cross, National Tuberculosis Association, American Social Hygiene Association, American Society for the Control of Cancer, American Heart Association, and the National Foundation for Infantile Paralysis are some of them. The Rockefeller Foundation and other philanthropic organizations devote themselves to health problems in many parts of the world (*see Philanthropy and Charities*).

The LIVING PUMP That Circulates OUR BLOOD

H EART. The beat of the heart is the symbol of life. Night and day, from birth to death, it pumps back and forth through our bodies the blood that keeps every part of us alive. Its rhythm is a measure of our activity and our emotions. It speeds up when we exert ourselves or get excited. When we rest or when we are depressed, it slows down.

When the average adult is resting, his heart beats about 70 times a minute, but many healthy people have rates considerably slower or faster. Violent exercise may set the heart beating 200 times a minute or more. The hearts of young babies beat about 130 times a minute, even when they are asleep. Among animals it is generally true that the smaller they are, the faster beats the heart.

The arteries that carry blood from the heart have muscular walls which expand and contract like the heart itself and thus help to force the blood into re-

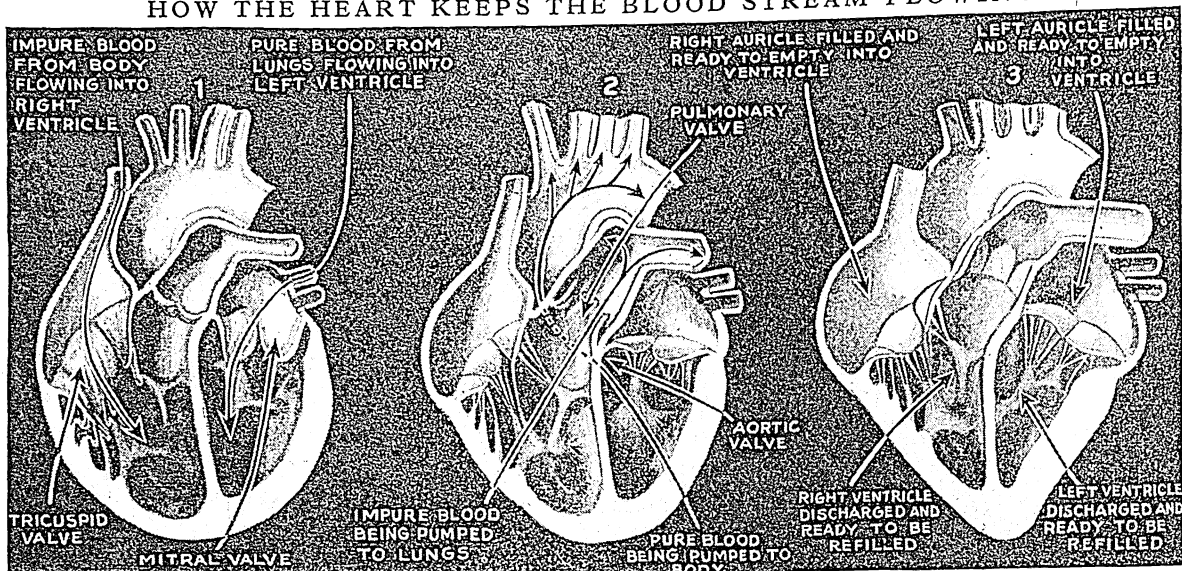
mote parts of the body. Their "beat" keeps time with the heart and is called the pulse (*see Pulse*).

Heart-like organs for circulating body fluids are found far down in the scale of life. The earthworm, for example, has a tube with muscular walls that contract in a regular rhythmic way. The hearts of fishes are two-chambered; of reptiles, three-chambered; of birds and mammals, four-chambered.

In the human body the heart lies under the ribs slightly to the left of the breast bone. It is shaped like a somewhat flattened pear with the stem end pointing downward. When fully developed, the heart is about 5 inches from top to bottom and about $3\frac{1}{2}$ inches wide, and weighs from 9 to 11 ounces.

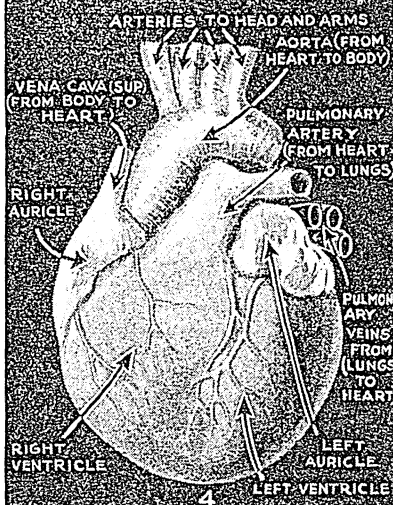
The heart's real work is done in contracting; the relaxing at the end of each contraction is a passive process. Then there is a slight pause before the next contraction. These pauses and the relaxing preceding

HOW THE HEART KEEPS THE BLOOD STREAM FLOWING



them total about 15 hours in every 24; so we can say that the heart works only nine hours a day. During these rest periods the heart feeds itself. Though it moves only about six ounces of blood at each stroke, it beats about 100,000 times in a day, so that the work done by it is equivalent to moving 12 tons in each 24 hours. The heart must be kept rested and fed, else its work is hindered.

The walls of the heart are made up of three coats—an outside coat; a middle one, which is a very powerful muscular layer; and an inner coat, very thin and delicate, which lines the heart and also forms part of the doors or valves. A partition runs down through the middle of the heart which divides it into two absolutely separate portions (the right and left sides). This really makes two distinct pumps, which work at the same time but handle somewhat different kinds of blood. Each side is again divided by a cross partition into an upper and a lower chamber. The upper chamber is called the "auricle" (right or left, as the case may be). The lower chamber is called the "ventricle" (right or left). In the partitions between the upper and lower chambers there are doors called valves. The door on the right side has three sections ("tricuspid valve"), and it is so hinged that the blood flowing into the lower chamber or ventricle will close the door when the chamber is full and prevent a backward flow. For the door will open only in one direction. On the left side the door between the auricle and the ventricle has only two sections ("mitral valve"). It is hinged and acts very like the door on the right side.



In the lower picture (4) you see how the divisions of the heart are named and how they connect to various parts of the body. Impure blood from the body comes to the right auricle. From there it passes to the right ventricle, which pumps it to the lungs. Returning purified from the lungs, it enters the left auricle, passes to the left ventricle, which pumps it out again to the body. The pumping process, shown in the three upper pictures, consists of a contraction which works from top to bottom of the heart on both sides at the same time. In (1) both auricles are filled, the right with impure blood from the body and the left with pure blood from the lungs, and the beginning of the contraction is forcing the blood through the valves into the ventricles. In (2) the contraction has passed to the ventricles. The "back pressure" has closed the valves to the auricles, and is forcing the blood from the right ventricle to the lungs and from the left ventricle to the body. In (3) the contraction is finished. The ventricles have been discharged, the auricles have been filled, and an instant later the process will be repeated.

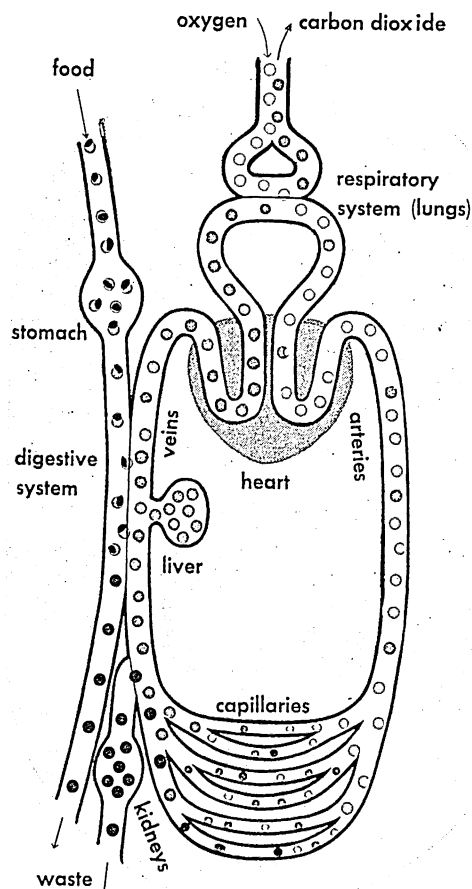
Opening out into an artery from each of the ventricles is another door made in three sections, and called the "semilunar valve" because it somewhat resembles a half-moon. These doors open and close automatically as the blood passes through. A physician with a stethoscope can tell by the sound of the valves whether they are working properly.

When we look closely at this double pump, we find entering the upper and right auricle large veins which have gathered up the blood from all over the system and brought it back to the heart. This blood is sadly lacking in oxygen and has much carbon dioxide, a waste material. Entering the right auricle, this dark venous blood passes on through the valve into the right ventricle and is then pushed by the contraction of the ventricle on through the semilunar valves into the pulmonary artery, which carries it to the lungs. Here it gets rid of this carbon dioxide and takes up the life-giving oxygen. It is then gathered up in the pulmonary veins and carried back to the

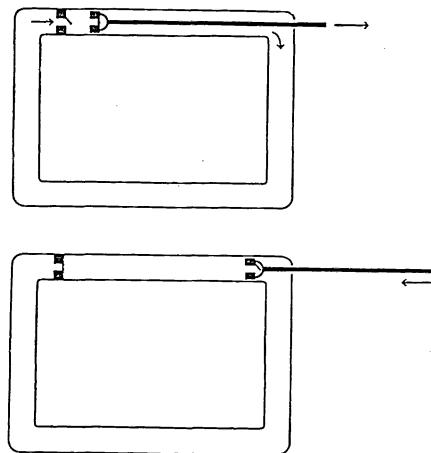
Heart

How the Heart and the Blood Serve the Body of Man

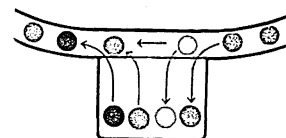
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How a pump in a closed circulation can work



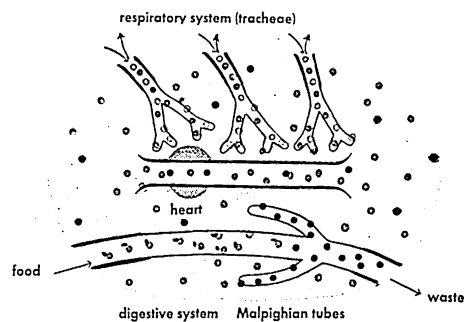
How a cell is cared for by blood



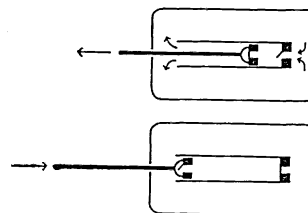
green: food red: oxygen
black: waste blue: carbon dioxide

Note: This simplified diagram does not show how blood vessels ramify to all parts of the body

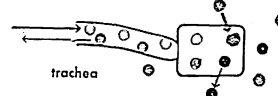
How the Heart and the Blood Serve the Body of an Insect



How a pump in an open circulation can work



How a cell is cared for by blood



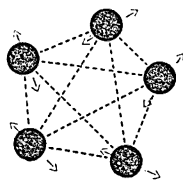
In the upper part of this page we see how the heart-pump works in the *closed* circulatory system of man, where it forces the blood around and around through the arteries, capillaries, and veins. Here it is the pump for both the food and the oxygen circulation. The blood picks up food from the digestive system and oxygen from the respiratory system and carries these materials to the individual cells, as shown in the close-up of a cell. It also carries away carbon dioxide and other waste. In the lower part of the page we see how the heart works in the *open* circulatory system of insects, where it forces the blood into body cavities, not into blood vessels. Here it is the pump for the food circulation only, not for the air circulation. The close-up shows that in insects a cell gets oxygen not from the blood but from separate air tubes (tracheae), which also carry off the carbon dioxide.

Heat - Molecules in Motion

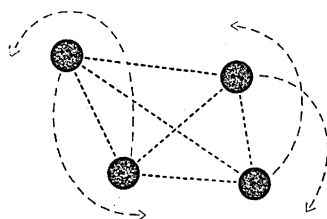
The Behavior of Molecules

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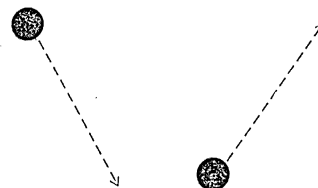
in Solids



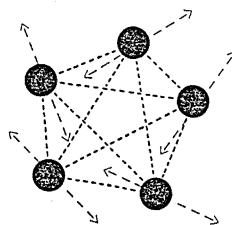
in Liquids



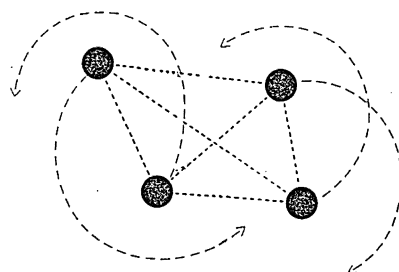
in Gases



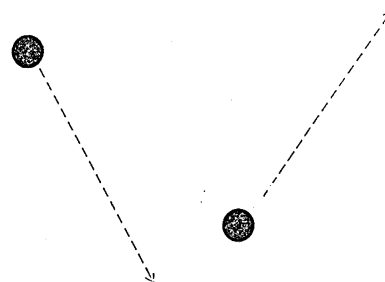
Increased Motion = Increased Heat



expansion, melting



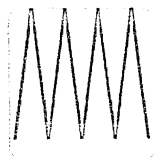
expansion, vaporization



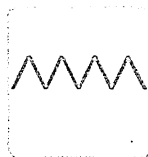
expansion, more pressure

Hot Bodies Give Heat to Cooler Bodies

'hot'

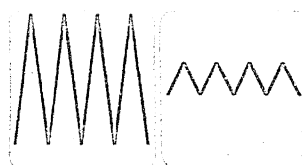


'cool'

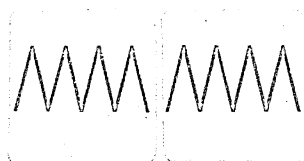


That means: the motion of the molecules is stimulated by the motion of their neighbors

brought into contact

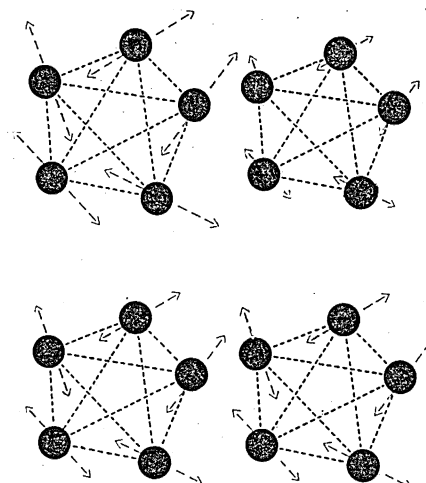


after a while:



'heat' is equally distributed

after a while:



all motions are equal

Cohesion draws molecules together. Heat-motion forces them apart. The diagrams at the top show that a substance is a solid, a liquid, or a gas, depending upon the balance that exists between cohesion and heat-motion. In a solid, cohesion dominates; molecular motion can take place only as vibration. In a liquid, cohesion and heat-motion are evenly balanced, and the molecules can slip past one another. In a gas, heat-motion overcomes cohesion. The molecules are widely separated and fly about freely. The lower diagrams show how heat passes from a hot body to a cooler one. At the left, the degree of heat in each body is shown by wavy lines. When the bodies touch, heat passes from the hot to the cool body until both reach the same temperature. At the right, we see how the molecules behave. As the two bodies touch, the faster moving molecules stir up the slower ones, until all are moving at the same speed.

heart. Here it enters the left auricle. This cycle is known as the lung or "pulmonary circulation."

The blood now contains oxygen, and is ready to be sent all over the body. It is bright scarlet in color and is called arterial blood.

How the Pumped Blood is Distributed

On entering the left auricle, it flows (partially forced by the contracting auricle) through the door into the left ventricle, and from there is forced by the contracting ventricle through the semilunar valve into the "aorta," to be distributed all over the body. It passes through smaller and smaller arteries, until it finally gets into the thin-walled capillaries from which it reaches every cell of the system. These capillaries are the tiniest blood-vessels in the body, and it is here that the vital process of "osmosis" takes place, or the actual exchange of the fresh food for the accumulated wastes of the tissue cell. The blood is now ready to go back to the heart. It takes a drop of blood about half a minute to complete the cycle and get back to the heart. The circulation controlled by the pump on the left side is known as the "systemic circulation." And since it must send the blood so much farther, the muscular walls of the left ventricle are much more powerful than those on the right side. (See Blood; Physiology; Respiration.)

The heart is automatic; that is, it starts its own beat. But the action of the heart is regulated by two separate nerves. One, the "sympathetic nerve" makes it work faster, the other set of nerve fibers, known as the "vagus" nerve, behave in just the oppo-

site way, tending to slow down the work of the heart. The two keep the action nicely balanced.

The heart may become diseased, mainly from one or two causes—either from overwork or by infection from bacteria carried by the blood. The infection often takes place in bad teeth or tonsils. The infected blood of necessity comes in contact with the delicate inside lining of the heart, and often causes an inflammation which prevents the valves from working properly. This inflammation may spread over the whole inside wall of the heart and bring about more or less serious results. However, the valves naturally suffer the most.

Danger of Overworking that Heart of Yours

We may overwork the heart by too violent exercise or too prolonged. This compels the muscle to work too rapidly, depriving it of its rest period, and hence cuts down the food supply of the heart itself. The heart may be permanently dilated or enlarged. Perhaps the valves get so crowded as to tear them and more or less permanently disable them, when a chronic disease is fastened on them. This is why we should never engage in violent athletic exercise immediately following a meal. The heart is already working hard to supply the digestive organs with extra blood, and if the muscles are put in action at the same time, the heart is overworked.

Anything which tends to disturb the fine balance or regularity of the heart-beat will produce trouble if kept up—possibly palpitation (a too rapid beating) or an inability to contract and expand properly.

The MARVELS of HEAT, and HOW MEN Have MASTERED IT

Once Thought to be a Substance, Now Known to be a Form of Motion—What Science Tells Us of Absolute Zero, and of the Heat of the Sun—How Heat Travels and is Measured, and the Wonderful Heat-Engines that Do Our Work

HHEAT. Do you ever wonder what heat really is? Perhaps it would surprise you to learn that for centuries very learned men were puzzled by this question. They weighed a piece of metal and then heated it, only to find that adding heat did not increase the weight. They found, however, that adding heat did increase the size. So these wise men of old were led to believe that heat was a mysterious fluid, which was invisible, weighing nothing, but which could flow in some way from the hot body to the cold body. This fluid they called "caloric."

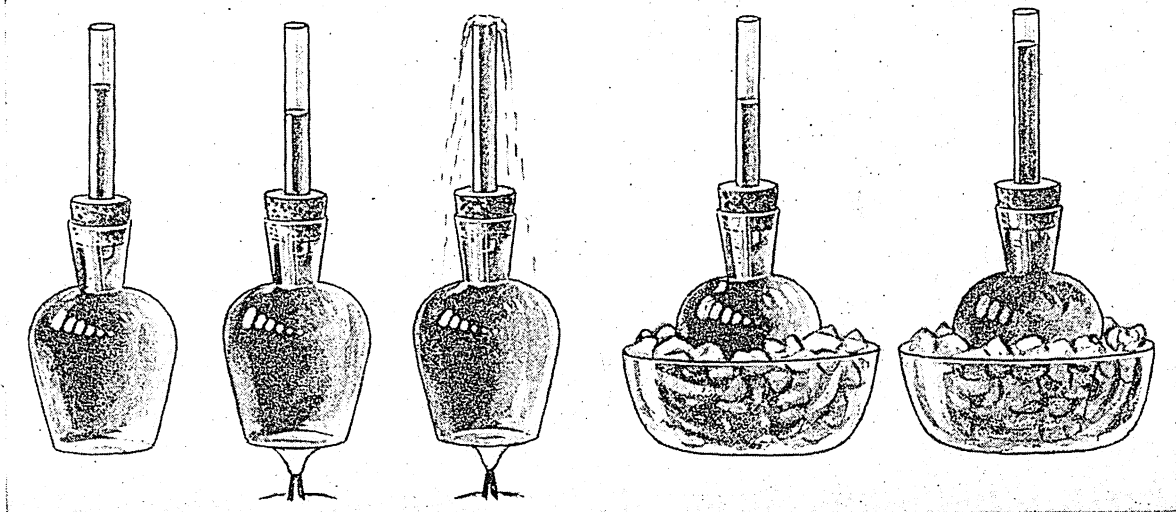
This idea that heat is a material substance was believed until almost the year 1800, and old textbooks in physics speak of "caloric" flowing from one body to another. Thus, caloric was said to flow from the hot coals to the kettle of water. Then in 1798 and 1799 two men, Count Rumford and Sir Humphry Davy, showed by experiments that heat could not be a material substance.

Count Rumford's name, before he was made a noble in Germany, was Benjamin Thompson. He is of special interest to Americans, for he was born in 1753 at Woburn, Mass., the son of an American farmer. He became one of the world's great scientists and engineers, and though he spent most of his life in Europe he did not forget his native land. In his will he left funds to Harvard College for a professorship, and Harvard College still has a "Rumford" professor of physical science, and there is a fund called the "Rumford Fund" to help work in the science of heat.

What a Cannon Taught about Heat

In 1798 Count Rumford wrote to the Royal Society of London an account of experiments that he made while boring brass cannon in Munich for the Bavarian army. He observed (what every machinist knows) that in boring metal the tool and the metal both get hot; but Rumford asked: "Where does this heat come from? What is this heat?" He insulated

STRANGE BEHAVIOR OF WATER WHEN HEATED AND COOLED



Most substances expand steadily when heated. Not so water. The first picture at the left shows a flask and projecting tube containing water just above the freezing point. Note where the water stands in the tube. In the next picture heat has been applied to the flask. The water in it starts to contract, you see. This continues until the temperature rises to about 39° F. (seven degrees above freezing). Then the water begins to expand again until it reaches the boiling point, illustrated by the third flask. The last two flasks show the effect of cold. The bowls are filled with cracked ice and salt, such as is used in making ice-cream. In the first of the two flasks the water is just beginning to freeze. In the second it has turned to ice, and expanded greatly during the process. The force of expansion when water turns to ice is enough to burst great iron pipes.

his brass block by felt, so that the heat could not come from outside; then he used blunt tools and got fewer metal chips, but by using more and more mechanical work he did get more and more heat. In his account he wrote: "It is hardly necessary to add that anything which an insulated body can furnish without limitation cannot possibly be a material substance. It must be *motion*." He meant the motion of the particles of the body.

Then next year Rumford's friend, Sir Humphry Davy, made another experiment to prove that heat was not a substance. He performed his experiment one freezing winter day. He arranged to rub two pieces of ice in a vacuum, and found that he could melt the ice by friction, even when all nearby bodies were below the freezing temperature. He then asked, "Where can this so-called 'caloric' come from?" The only answer was: "There is no substance caloric. Heat is simply motion given to the particles or molecules."

From these experiments of Rumford and Davy the world should have learned the true nature of heat. But it was not until 40 years later that the world realized the full truth of the ideas and experiments of Rumford and Davy. Then, in 1840, James Prescott Joule of Manchester, England, by churning up water and thus heating it, measured in long careful experiments the work needed to produce a unit of heat, that is, he got "the mechanical equivalent of heat." We know from Joule's work, which has been repeated by many others, that it takes 778 foot-pounds of work to produce a "British thermal unit" of heat.

Thus these great men, Rumford, Davy, and Joule, showed us what heat is. If you hammer a piece of

iron it gets hot, because the blows of the hammer give motion to the molecules of the iron. You rub two dry sticks together, and under good conditions you set the molecules in such rapid motion, producing so much heat that the wood catches fire (*see Fire*). To explain heat, then, we must remember that all matter is made up of molecules, and that in all bodies, at the temperatures we know, the molecules remain more or less in motion. Can we ever stop this motion entirely? In other words, is such a thing as a perfectly cold body a possibility?

What "Absolute Zero" Means

We know that the volume of a gas, when the pressure is constant, depends on its temperature. Now, when a gas is cooled to low temperatures, reducing its molecular activity, it contracts about $\frac{1}{273}$ of its volume for each drop of one degree Centigrade. This shrinkage can continue, of course, only until the gas freezes. But because of the ratio thus established between loss of heat and lowered molecular activity, scientists believe that a temperature of -273.1°C . (-459.6°F .) would bring the molecules of a body to rest and the body would have no heat. This temperature is called *absolute zero*.

Many experimenters have produced temperatures within a fraction of a degree of absolute zero by the evaporation of a liquefied gas. Another method is to chill some substance, while keeping its molecules in motion by a magnetic field. Removing the field causes the molecules to lose most of their motion. Metals chilled nearly to absolute zero by this means have so little resistance to electricity that currents in them may continue to flow for hours after the source of supply has been shut off.

No one knows whether there is an extreme limit of temperature at the other end of the scale. The carbon arc develops temperatures ranging from 3,500° to perhaps 7,200° C. (6,300° to 12,000° F.). The temperature of the sun is thought to be upwards of 5,500° C. (10,000° F.).

Getting and Using Heat

More practical questions for the average man are: "How can we get heat when we want it?" and "How can we transfer heat from place to place?"

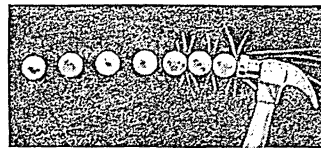
Different parts of the earth get different quantities of the sun's heat, and the different seasons are due to the different quantities of heat received from the sun. In winter, in the most civilized countries, the sun's heat is not enough to keep our houses comfortable, so we must use artificial heat. We must also use artificial heat for cooking, and for producing steam for the engines in our factories and power plants and for our locomotives and steamships.

Our great source of artificial heat is found in the burning of wood, coal, oil, and gas. The oxygen of the atmosphere combines with the carbon and gases of the fuel, and in so doing releases energy which sets the molecules in violent motion—that is, produces heat. There are many other chemical actions that produce heat, but the burning of coal, oil, and natural gas is the great artificial source of heat. Think what we should do if we could not get coal or oil to produce heat! Our houses would be cold in winter, and our locomotives and all the other engines of the world could not run.

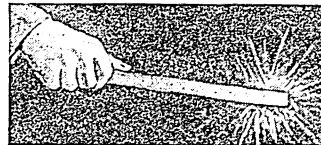
Another method of producing heat is by passing an electric current through wires (*see Electricity*), and many helpful devices make use of electric heating. It is, however, indirect and, except for certain technical or labor-saving purposes, more expensive than the others. Most of our electricity is generated by burning coal or oil or some other fuel, and a considerable amount of the original energy is lost in the transformation, first into electric current, then back into heat again. (*See Electric Light and Power; Fuels.*)

Heat travels in three ways: by *conduction*, by *convection*, and by

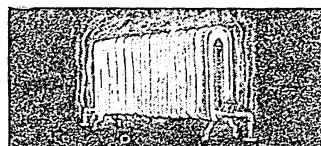
FACTS ABOUT HEAT



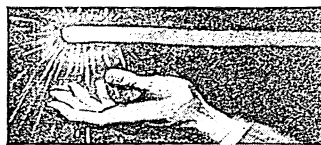
Heat is created and transmitted by the impact of molecules.



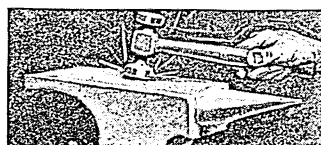
Molecules of the bar carry the heat to the hand by "conduction."



Heated air rises and spreads, carrying heat by "convection."



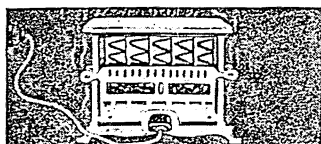
Heat travels in all directions by "radiation" through the ether.



Impact between objects speeds up their molecules and so causes them to become heated.



The rapid motion of molecules undergoing chemical changes is the cause of heat in fire.



A heavy electric current passing through resisting wires creates heat.



The "British Thermal Unit" is the amount of heat needed to raise one pound of water one degree in temperature.

radiation. When one end of an iron bar is placed in a fire, the rapidly moving molecules of the hot coals and hot gases strike against the iron molecules, and so the iron molecules that touch the fire are given violent motion. These first molecules pass the motion along to other molecules farther back in the iron; and soon the heat travels or is *conducted* to the hand that holds the iron. That is, in conduction the heat motion passes along just as motion passes along a row of balls which bump against each other. The best conductors of heat are the metals. Wood is a poor heat conductor. This is the reason you can hold a burning match even while the wood burns only an eighth of an inch away. A metal wire would have to be several inches long for you to hold it in your hand when one end was red hot. We wrap steam pipes with felt and asbestos because felt and asbestos are poor heat conductors. We wear woolen clothes in winter because woolen cloth does not readily conduct the heat away from the body.

Now take the hot iron bar out of the fire. The air about it is heated, and the hot air rises. In this case, the heat travels upwards by *convection*—that is, by being conveyed by the currents of heated air. In the hot-air furnace for house heating, the heat is transferred to the rooms by convection—by the flow of hot air through metal ducts. It is by convection, using the flow of steam or hot water through iron pipes, that heat is transferred in steam and hot-water heating systems. In convection, heat is conveyed by moving the hot matter itself as in the case of streams of hot air, hot water, or steam.

But heat can reach your hand from the hot iron bar when your hand is at some distance *beneath* the hot bar. There is no stream of hot air to the hand in this case, because hot air rises. In this case the heat travels neither by passing along from molecule to molecule, as in conduction, nor by the conveying of currents of hot matter, as in convection; but it flies directly across space. This is the way heat and light come to us from the sun across stretches of empty space. This method of transfer is called *radiation*. And what is radi-

ted heat? Evidently it is different from the heat that was described earlier as due to the motion of molecules of matter, for there are no molecules of matter in the vast stretch of space between earth and sun. Here is the distinction. A hot body by the very motion of its molecules sets up waves in the space around it, similar to light waves, but invisible (*see Light; Radiation*). We call them heat waves, or infra-red rays, yet in the ordinary sense they are not heat at all, but

ships, one after the other, by focusing upon each the rays of the sun reflected from a large number of huge mirrors (*see Archimedes*).

How Heat Is Measured

There are two measurable factors in the heat of any substance. First is the *intensity* or *degree* of heat, which we call the temperature and which depends solely on the rapidity of molecular vibration. This is measured by a *thermometer* (*see Thermometer*). It is

HOW ICE MIGHT BE USED TO START A FIRE



If you were caught at the North Pole without matches, or flint, or other means for starting a blaze, what would you do for fire? If you knew enough about the nature of heat and radiation, it might occur to you to shape a rough lens out of clear ice, and with it concentrate the rays of the sun upon inflammable material, as you see this man doing.

merely rays of energy of such nature that they will produce heat in objects that they strike. The difference between heat and heat waves is similar to that between electricity and radio waves (*see Radio*).

How Heat is Absorbed or Reflected

Substances absorb heat radiation in widely varying degrees. If you lay a black cloth and a white cloth side by side on a cake of ice and expose it to the sun, the ice will melt much more rapidly under the black cloth than under the white, because black absorbs most of the heat rays while white reflects a large proportion of them. This is one reason why people find white clothes cooler than dark clothes. Surface condition likewise plays a part; a rough surface absorbs more heat energy than a smooth one.

From the sun the earth absorbs an amount of heat energy that makes all other sources puny by comparison. Every square foot of the sun gives off as much heat as would be produced by burning 1,500 tons of coal on each square foot every hour. These heat waves, being much like light waves, can be reflected and refracted. Thus, at the focus of a lens or "burning glass" there is gathered both the visible and invisible radiation, so that fire can be started by putting paper or shavings at that point. A concave mirror can be used for this same purpose of concentrating radiation. There is an old story that the Greek philosopher Archimedes of Syracuse set fire to the Roman war

ships, one after the other, by focusing upon each the rays of the sun reflected from a large number of huge mirrors (*see Archimedes*).

with this measure of heat that we are commonly concerned, because our skins are sensitive to it. But the second factor is of great importance to us in many indirect ways. It is the *quantity* of heat that a given amount of substance possesses. It is evident, for example, that at the same temperature a gallon of water contains more heat energy than does a cupful; a ton of coal, though it burns with no greater intensity than a pound of coal, will nevertheless yield 2,000 times as much heat.

The quantity of heat energy in a body depends, then, upon the *mass* of the body. It depends also on the *kind of material* that composes it. A pound of aluminum, for instance, will absorb seven times as much heat as will a pound of lead before it shows the same rise in temperature. This property of a material is called its *specific heat* (*see Water*).

Instruments that measure quantity of heat are called *calorimeters*. Some operate on the basis of the amount of ice melted or the amount of water vaporized; others indicate the amount of electrical current generated according to the thermocouple principle. The units of measure are the British thermal unit and the calorie (*see Calorie*).

The study of the phenomena of heat continues to be one of the most important branches both of theoretical physics and industrial science, for it deals with basic energy (*see Energy; Power*).

We know by experience that mechanical work can produce heat. Indeed, if our engines and machines are not properly oiled, we get heat at the expense of work when we do not want heat. The reverse question is: Can we turn heat into mechanical work? This is just what James Watt and other great engineers have done with such wonderful results for modern industry. The steam engine and the gas engine are the wonderful heat engines which get mechanical power from heat. It is the science of heat that has given us these marvelous engines to turn the heat stored in coal and oil and gas into power, to run our factories, to light our homes, and to transport our goods and ourselves across land and sea and through the air.

HEATHER. The song and story of Scotland are filled with praises of the "bonnie blooming heather," which clothes the rugged Highlands with a soft vesture of purple, and mingling its delicate fragrance with the atmosphere enters into the very life of the people as perhaps no other plant has done in any land. Of it one Scottish poet sings:

O sweet is the breath of the heather
On braes of the Highlands that blows;
O rich is its bloom when at evening
The hills glow in purple and rose.

The heather—or "ling," as it is sometimes called—is found not only in Scotland, but also throughout northern and western Europe. It is a small evergreen shrub, sometimes rising only a few inches above the

ground, but often growing to a height of three feet or more. On its purplish brown stems are close-leaved green shoots and feathery spikes of tiny bell-shaped flowers, usually rose-lilac in color, but ranging from deep purple to pure white. White heather, which is somewhat rare, is the most prized of all, and in Scottish superstition this beautiful plant is regarded as a bringer of good luck.

Not only does this hardy plant lend beauty to the landscape, but it serves many useful purposes. The tops afford winter forage for Highland sheep and cattle. The flower is a favorite of the bee and heather honey has a delicious flavor. The larger stems are made into brooms, the smaller into brushes. Owing to the scarcity of wood, the Highlanders in former times built their "shielings" or cabins of heather stems cemented with mud, and used it as a thatch; and heather laid on the ground with the small twigs uppermost formed a comfortable bed for the warrior, as it still does for many a shepherd and hunter.

The common heather (*Calluna vulgaris*) belongs to the family of plants called heaths (*Ericaceae*), from the fact that they grow on open tracts of poor and uncultivated land. There are more than 400 species, the greater number being found in South Africa; some of these species have flowers of large size and brilliant color. Other varieties grow in the Mediterranean region in Europe, and one of these (*Erica scoparia*) is used in making the so-called "briarwood" pipes. Heather like that of Scotland has been found in the eastern part of North America, but many scientists think it was introduced by early settlers. African species are sometimes cultivated as a garden or hothouse plant.

ARTIFICIAL CLIMATES for Our Buildings

Ingenious Equipment that Turns Winter into Summer in Our Homes, Offices, and Public Buildings—How the Heating Engineer Conquers Cold

HEATING AND VENTILATION. "We deliver climates—hot or cold, wet or dry." This advertising boast of one of America's great makers of heating and ventilating equipment gives an idea of the wonders of this recent development of science. Until Benjamin Franklin invented the closed iron stove, the open fireplace was almost the only method of heating known, and this primitive and wasteful method is still the one used in most of the homes in England. But throughout the United States and Canada, heating by hot air furnaces, and by hot water or steam conducted through cast iron pipes has been so perfected that our homes and public places can now be kept at almost any temperature desired, regardless of the weather conditions. Furthermore, the related problem of obtaining sufficient supplies of fresh air has been worked out so completely that wherever homes or public places are badly ventilated, you can lay the fault to ignorance or carelessness.

The human body is continually manufacturing heat from the food it receives, but when the air is cold this heat escapes from the body faster than it can be produced. Hence clothing is necessary to prevent the heat from being given off too fast, and in cold climates

dwellings must be artificially heated to supplement the heat of the body. To allow the bodily temperature to sink below normal (usually 98.6 degrees Fahrenheit) weakens vitality.

Most people work better and feel better if the room temperature in winter is kept at about 68° Fahrenheit, with suitable arrangements to keep the air sufficiently moist and to keep it in motion. When the room temperature rises much above this point, the surplus heat of the body is removed too slowly, with the result that the heart beats faster, the walls of the blood vessels relax, and more nervous energy is used. The lungs and the membranes of the nose and throat lose some of their normal resistance to disease germs; and the body falls an easy prey to colds, throat ailments, and pneumonia. Persons in overheated rooms are likely to get headaches and become sluggish, both mentally and physically. They yawn and stretch and their muscular strength decreases. They memorize less effectively, they perform mental work more slowly, and they make more errors, as experiments have shown.

Overheating is especially likely to occur where not enough attention is given to keeping the air properly

moist or humidified. Dry air in a room draws moisture from plants so that they may die, from furniture so that it may warp or crack, and from the human body, producing a chilly feeling and making throats and skins dry and irritated. For comfort in dry air we may want 75 degrees temperature or more, whereas with properly humidified air 68 degrees usually is sufficient.

Getting Healthful, Moist Air

Modern furnace plants supply moisture by using evaporating pans in the furnace. A common way to supply humidity with steam and hot water plants is by placing pans of water on the radiators; but usually the pans do not supply moisture enough. With a coal range in the kitchen, a large pan of water can be kept simmering there, with all doors open inside the house; or a curtain may be hung behind each radiator, with the bottom dipping into a pan of water. Various patented devices are available. The humidity can be checked by means of a *hygrometer* (see *Hygrometer*).

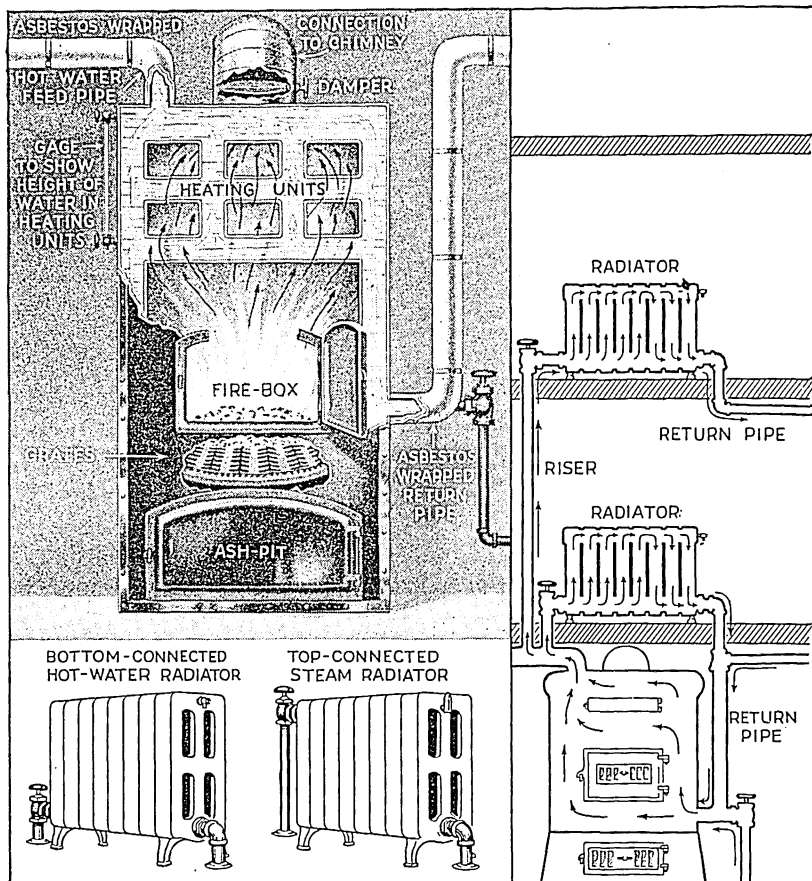
Open fireplaces are wasteful, since they send 80 or 90 per cent of the heat up the chimney; improved base-burner stoves may deliver 70 per cent of the heat in the coal to the room (see *Stoves and Fireplaces*). Good furnaces utilize better than half the heat value in coal. Steam and hot water systems do better; some of the large plants are equal to the base-burner stove in heat efficiency. The claim has been made that if a furnace-heated house needs 12 tons of coal a season, 9 tons will be enough with steam heating, 8 tons with hot water, and even less with a vacuum or vapor heating system.

Heating methods classified as *direct* warm rooms by means of apparatus such as a stove or a radiator placed in each room. *Indirect* systems warm the air in a furnace or by steam or hot water coils, then send the warm air through ducts or flues into the rooms. The *direct-indirect* system uses steam or hot water radiators, with cold air inlets, inside each room.

Hot Air, Hot Water, and Steam Heat

Hot air furnaces are widely used in small houses. Cold air from outdoors is warmed in a chamber surrounding the fire, then rises through flues to the rooms, entering through grilles or registers which have shutters to regulate the supply. The hot air system has several advantages: it is simple and costs less to put in than other systems; it combines ventilation with heating; and it responds quickly to changing

HOW HOT WATER AND STEAM HEAT HOUSES



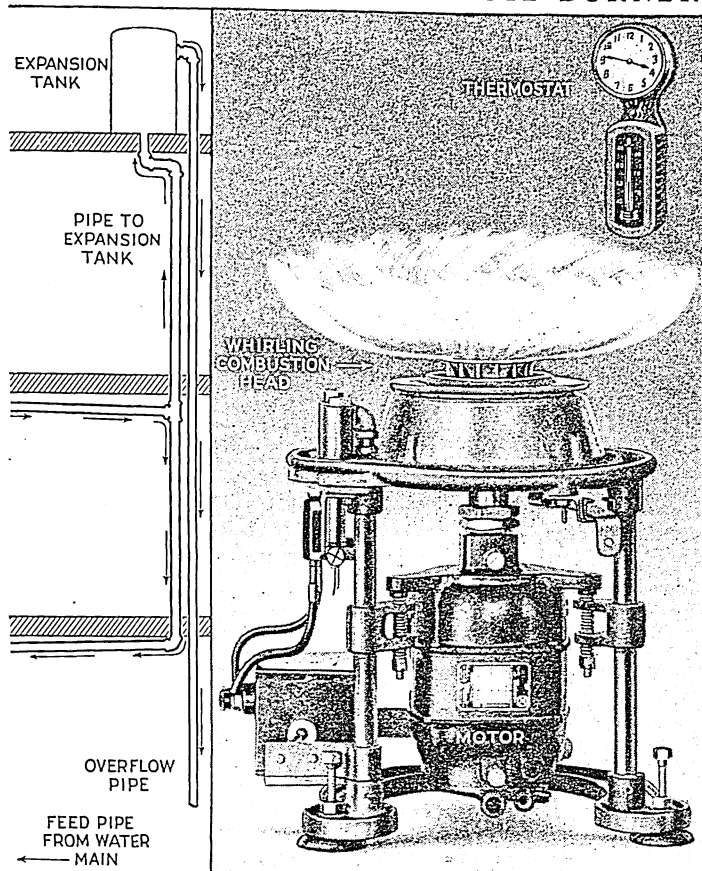
To start a hot water system, we fill the boiler from the water main, and light the fire, as shown at the upper left. The diagram shows how hot water then rises from the heater, circulates through the radiators, and comes back through the return pipe. Expansion of the heated water is taken care of by the expansion tank and the overflow pipe. A two-pipe steam heating system operates in much the same way, save that steam, instead of water, rises from the boiler and returns condensed to water. In

requirements. On the other hand, it is usually less economical to operate; fuel gases often leak into the air supply; and rooms far from the furnace or on the windward side are hard to heat.

In hot water systems, water heated to between 180° and 200° F. rises—because hot water is lighter than cold—through pipes to radiators where it gives off its heat. It returns to the furnace through the same pipe line (one-pipe system), or through another set of pipes (two-pipe system).

Steam heating uses much the same equipment. Steam rises from the boiler to the radiators where it gives off its heat as it condenses to water. The water returns to the boiler through the same pipes or another set. Each radiator has an air valve attached to it, which allows the air in the radiator to escape but which closes when the steam reaches it. This accounts for the whistling or hissing you often hear when you "turn on" the radiator. If the piping is not properly arranged, the condensed water may settle in low places and obstruct rising steam, causing the annoying noise known as "water hammer."

AND THE "AUTOMATIC" OIL BURNER



one-pipe systems, the water drips back through the same pipe that supplies steam. At the right we see a rotary-type oil burner, which is mounted in the firebox under the boiler. The combustion head, whirled by an electric motor, breaks the heavy oil up into a fine mist and mixes it with air for burning. Above the burner is shown the thermostat, which automatically regulates the oil supply by electric controls to maintain any temperature that is desired.

Hot water heating is cheaper to operate because water will circulate with a very low fire and supply the heat needed in mild weather, while with steam heating we usually must take all the heat the radiator will give or turn it off. But hot-water radiators give off only about two-thirds as much heat as steam ones of the same size; hence they must be larger, and are more expensive to install. Radiators are built in sections, which can be added or removed to adjust size.

In steam heating a large part of the fuel has to be used to drive air from the system. In *vacuum* heating the air is exhausted from the boiler and pipes so that the steam does not have to force its way against the pressure of the atmosphere. Furthermore, since the water is heated in a vacuum, steam is produced at a temperature as low as 98 degrees, instead of at the normal 212 degrees. The saving in fuel by this method is claimed to be 20 per cent over the regular steam system. *Vapor* heating is conducted on the same principle as vacuum heating, except that the apparatus is so contrived that the vapor produced from water below the normal boiling point—at about 90 degrees

Fahrenheit—is circulated before more than a few ounces of pressure is recorded by the gauge. In what is known as the *vacuo-vapor* system, the two principles are so combined that the system may be operated at any desired point, from the lowest pressure of steam possible up to a considerable steam pressure, thus giving a range of radiator temperature from about 140 degrees to 215 or more.

In some cities central steam or hot water heating plants supply heat for homes and business houses within a certain zone. This arrangement of community heating, called "central" or "district" heating, is both convenient and economical. Steam can be sent a mile or more without much loss.

Electricity, Gas, and Oil for Heating

Electric heating would be an ideal method except for its cost. It is used in street cars and such household devices as small grates, radiating reflectors, and heating pads. Heat is developed by passing a current through high-resistance wires.

Coal and coke are the fuels used in most furnaces, but gas and oil heating have greatly increased. The latter systems cost more to put in and usually cost more to operate, but they work automatically with little attention, they are clean, and they release basement space for other uses. (For suggestions about heating systems and fuels, write the Superintendent of Documents, Washington, D. C., for lists of government bulletins on these subjects.)

To regulate heat to meet the variations of weather, mechanical watchmen called *thermostats* are employed. Functioning automatically, they regulate dampers, open and close registers, control radiator valves, and sometimes set off alarms when a given temperature is reached. These tasks are usually accomplished by electricity; part of the circuit is a mercury or bi-metal thermometer, with mechanism set so that the circuit is opened or closed when the heat-sensitive element reaches a certain temperature (*see* Thermometer). When oil is burned, the automatic controls often include a device using a photoelectric cell, which shuts off the ignition circuit and oil if the flame goes out.

Proper ventilation is as important as proper heating (*see* Hygiene). The air must be kept circulating at a moderate rate or it will not remove heat given off by the body. It used to be thought that proper ventilation could be maintained only by introducing at least 30 cubic feet of fresh outdoor air per minute for each occupant. Heating and ventilating engineers now consider ten cubic feet a minute sufficient if the air is kept moving. In the average room, adequate circulation can be maintained by keeping one window slightly opened at both the top and the bottom.

Many believe that open window ventilation is satisfactory for the average schoolroom, if slanting or curved window boards are used to prevent drafts and

if exhaust ducts are provided to carry off the overheated air. Auditoriums and theaters are generally ventilated by a system of fans and blowers.

The New Industry of Air Conditioning

THE latest development in heating and ventilating engineering is "air conditioning." This provides buildings with air that is scientifically correct for comfort and health or for certain industrial processes.

In the 19th century, cotton and tobacco factories began installing equipment to keep the air properly moist. About the time of the first World War, theaters found that air-cooling apparatus paid, by drawing patrons in summer. By 1934, air conditioning was being used in hotels, restaurants, railroad trains, office buildings, and homes.

How Air Conditioning Works

For complete comfort indoors, air should have the right temperature, be free from dust and smoke, and especially should have the right humidity (see Evaporation). Windows must be kept closed, so that all air used is drawn through the conditioning apparatus. In winter the apparatus warms the air, then passes it through a water spray, which removes impurities and supplies moisture for humidity. In summer, a refrigerating device cools the spray water to just above freezing. The spray chills and cleans the air, and corrects undue humidity by condensing excess moisture. Conditioned air may be conducted in ducts through the structure; or each room may have a "conditioning unit," supplied from a central source with cold or warm water and heating energy.

A few years of experience with air-conditioned theaters and trains suggested to engineers, business men, and the general public that the greatest field of all for air conditioning should be the home. But central apparatus might cost several thousand dollars, and a thousand dollars a year or more to operate.

The first household units, therefore, were made small, to serve one room. They sold well enough to suggest that air conditioning could be made the basis of a giant industry, comparable to automobiles or radio.

From 1905 until after the first World War, the automobile provided the "new industry," employing millions doing work that never had existed before. After the World War, radio similarly created a new type of work for scores of thousands. Each of these industries had to overcome high costs at the start, but did so by developing a market big enough to warrant using mass production methods. The air-conditioning industry should have a similar development.

Vocational Opportunities

Today there is a large field open for engineers competent to design air conditioning for industrial use. A striking example of such work is equipping deep gold mines in Brazil and Africa, so that men can work at depths where formerly the heat was unbearable. Much work is being done also to design low-cost apparatus for the home market. Once such apparatus is created, the 25 million dwellings in the United States alone should provide a vast market for an industry employing hundreds of thousands in its various operations, such as manufacturing, selling, advertising, installing, and servicing.

To succeed, however, thorough knowledge of the subject is required. Air-conditioning units will not "just work," like a radio set; each one must be fitted exactly to the building it serves. Young people wanting to enter the field should start, therefore, by mastering all the physical principles involved, such as those found under the subdivision "Heat" in the Reference-Outline for Physics (see Physics).

HEBE (*hē'bē*). In the Greek mythology this goddess Hebe typified eternal youth and joyousness. She was a comely maiden, with sparkling eyes and rounded form, ever smiling; and Milton in his famous poem 'L'Allegro' speaks of—

Nods, and becks, and wreathed smiles,
Such as hang on Hebe's cheek.

She was the daughter of Zeus (Jupiter) and Hera (Juno) and served the gods as cupbearer, until one day she tripped and fell. Then the lovely youth Ganymede took her place, and Hebe became the wife of Heracles (Hercules) after he was deified.

HEBREW LANGUAGE AND LITERATURE. To most persons of European descent the chief representative of the Semitic tongues is Hebrew, the sacred language in which most of the Old Testament was written and in which its Scriptures are still read in the Jewish synagogues. The Semitic languages (a group of Asiatic and African tongues) are divided into two great

branches, the northern and the southern. To the former belong Hebrew, Phoenician, Aramaic, and Assyrian, while Arabic and Ethiopic are of the second group. Hebrew and Phoenician are so closely related that they are considered as dialects of one tongue.

The Hebrew language is very ancient and was spoken in Palestine as early as 2,000 years before Christ. The words are short, for the most part, and the grammar and sentence construction are simple. Much is expressed in a few words, and though often rude, the language has strength, grandeur, and a deep sonorous quality well suited to poetry and the expression of religious feeling. As in other Semitic tongues the parts of speech are derived from roots or word-stems having three letters. Originally the Hebrew alphabet was made up entirely of consonants and the vowel sounds were omitted. Early in the Christian era, however, vowel signs were inserted underneath the consonants as is done today in some systems of short-

hand. The writing reads from right to left, as in Arabic, and from the back of the book to the front.

With the exception of parts of the books of Daniel, Ezra, and one verse in Jeremiah, which are Aramaic, the entire Old Testament is written in Hebrew. This and a few inscriptions are all that remain to us of ancient Hebrew literature. In their daily speech the Jews came gradually to use the Aramaic language of their Syrian neighbors, but Hebrew was preserved as a religious and literary language. In the first four or six centuries of the Christian Era there grew up a great body of writings known as the *Talmud* (meaning "teaching" or "learning"), consisting of two parts. The first of these, the *Mishna* or oral law, was written in Hebrew; and the second, the *Gemara* or commentary on the law, in Aramaic. The *Mishna* is a systematic collection of religious-legal decisions, developing the laws of the Old Testament. The *Gemara* is a great unordered mass containing arguments and opinions on the law, and much miscellaneous material—a "literary wilderness," it has been termed. Long discussions and hair-splitting arguments are often interrupted by charming tales and parables. In its pages are poems, prayers, anecdotes, and maxims, together with science and mathematics; tears and laughter are mingled, while side by side with the investigations of the learned are the wisdom and superstition of the unlearned. Despite its faults, the *Talmud* is a very great work. It formed a bond between the scattered Jews and kept alive their learning during the Dark Ages, making it possible for them to play a large part in the restoration of learning and the cultivation of science at the time of the Renaissance.

In the Middle Ages arose a body of literature embodying what is called the *Cabala*, a mystical interpretation of the Scriptures based on the assumption that every letter and number has a hidden meaning.

From early days the Jews have adopted the language of the country in which they happened to dwell. Even in the 1st century B.C., Josephus, the great Jewish historian, had written for the most part in Greek, probably because he could thus reach the greatest number of readers. His immortal 'History of the Jewish War' was written first in his native Aramaic and then in Greek, but only the Greek version has come down to us. Moses ben Maimon, or Maimonides, as he is generally called, the great Spanish Jewish rabbi, philosopher, and physician of the 12th century, wrote mainly in Arabic.

The Jews in Germany adopted German as their language, but they wrote it in Hebrew characters; and when persecution drove great numbers of them to the countries of eastern Europe, they carried this language with them. Mixed with some Hebrew and Slavic words, and written in Hebrew letters, this German dialect developed into the language known as *Yiddish* (from the German *jüdisch*, Jewish). It is widely used today among the Jews of Bohemia, Galicia, Lithuania, Russia, and other countries, being slightly modified by the addition of words from the

languages with which it has come in contact. Within the last century, particularly, quite an extensive literature has developed, and there are a large number of newspapers and periodicals in Yiddish, in the United States as well as in other countries.

Although Hebrew ceased to be a spoken language, as a literary language it has never entirely died out, and in recent times there has been a revival of interest in it, as a means of communication between Jews in various parts of the world. Periodicals and books are appearing in Hebrew, which is now recognized as one of the three official languages of Palestine.

HEBRIDES (*hēb'ri-dēz*) ISLANDS. Shortly before his death in 597, St. Columba the Irish missionary looked out upon the tiny island of Iona, one of the Hebrides or Western Isles of Scotland, and uttered a memorable prophecy. "Unto this place, albeit so small and poor, great homage shall be paid not only by kings and peoples of the Scots, but by the rulers of barbarous and distant nations, with their people also." And so it was. For this island of only five square miles became, through the work of St. Columba and his disciples, the most famous center of Celtic Christianity. From it missionaries were sent for the conversion of Scotland and northern England, and to it for centuries students flocked from all parts of the north. Kings and chiefs were brought to it for burial that their dust might mingle with that of the "blessed isle." From the end of the 6th to the end of the 8th century Iona's fame was scarcely second in importance to any of the British Isles. Then the Vikings swept down from the north, and not until the 13th century did the Norwegian kings give way to the Scottish kings.

Semi-feudal conditions continued until 1748, under the rule of native chieftains. Great depression followed the changes then introduced; rents became excessively high and large numbers of the tenants emigrated to North America. The potato blight in 1846 brought practically the entire population to the verge of starvation. Thousands were removed to Australia. Since then the system of land tenure has been revised and the hardships of the inhabitants' lot have been greatly lessened.

These islands off the west coast of Scotland are divided into two groups, the Outer and Inner Hebrides, by the ocean waterways of the Minch and Little Minch. The most important of the Outer Hebrides are Lewis-with-Harris, North and South Uist, Benbecula, and Barra; of the Inner Hebrides, Skye, Rum, Coll, Tyree, Mull, Colonsay, Jura, Islay, and Iona. Altogether, the Hebrides number over 500, but only 95 are inhabited. Of the total area of 2,812 square miles, only a small part is cultivated, the rest being moorland and mountain. Sheep farming, cattle raising, fishing, distilling, slate quarrying, and the weaving of Scotch woollens are the main occupations of the people. While the country is poor, the scenery is wild and picturesque, and numerous tourists add to the prosperity of those almost treeless, storm-wracked islands. Population of the two groups, 79,000.

HECATE (*hēk'ā-tī*). The dark mysterious goddess of this name was, in Greek mythology, especially favored by Zeus, king of heaven. From him she received great power in heaven, on the earth, and in the sea. She could give mortals wealth and prosperity, triumph in war and games, success at sea and in hunting, and many other gracious gifts. The wide range of her power is probably the reason that she was later confused and identified with other divinities. We find her sometimes identified with the moon goddesses Selene and Artemis, and also with Proserpina, goddess of the underworld.

Because of her connection with the lower world and night, Hecate finally became thought of as a deity of ghosts and sorcery, with fearful attributes. She represented the darkness and terrors of night and sent frightful demons from the lower world to teach black magic and witchcraft. Terrifying dreams were also attributed to her. Enchanters and enchantresses were her disciples. She herself roved with the souls of the dead, and was visible only to dogs, who howled and whined as she approached.

Protectress of Crossways

It was probably because Hecate was looked upon as a triple goddess, with the ability to look several directions at once, that she came to be popular as the protectress of crossways. Her favorite haunt was where two roads crossed, and she was supposed to protect all crossways, gates, and doorways from evil influences. At the close of every month offerings called "Hecate's suppers" were made at crossroads. These were given at night under a new moon and were to court Hecate's favor, to appease her anger and the anger of the hosts of evil spirits that accompanied her, or to prevent the souls of the dead from appearing. The supper was generally eggs, fish, onions, and honey. Black puppies and black ewes were sacrificed to her. Some scholars believe that Hecate was not originally a Greek divinity but was brought into Greek mythology from Thrace. It is suggested that her name may be a short form of a Greek word meaning "the one who comes from afar." Hesiod represents her as a daughter of Peres, a Titan. Later writers describe her variously as the daughter of Zeus and Demeter, of Zeus and Hera, and of Leto, or Night. Her characteristics, powers, and attributes are even more varied and mysterious than the legends about her parentage.

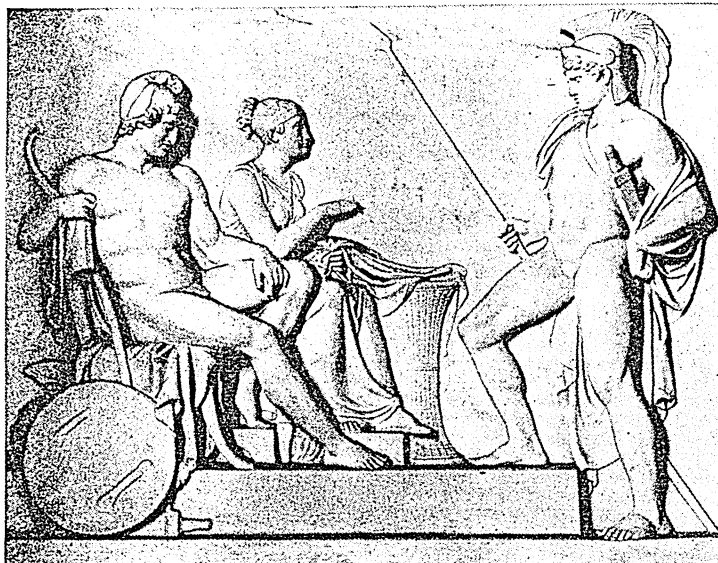
Shown with a Triple Body

In art, Hecate is usually portrayed as having three bodies and six arms. The bodies are placed back to back so as to face in three directions. Sometimes she is portrayed with three heads, one of a horse, another of a dog, and the third of a lion. Her three-fold character is thought by some to represent the phases of the moon—waxing, full, and waning.

HECTOR. When the Trojans in ancient times held out for nearly ten years against the besieging Greek armies, the mainstay of their defense was Hector, their greatest fighter. The Greek word "Hector" means "one who holds fast." In English, the name came to mean a bully or a braggart, though the famous warrior was neither of these.

Hector was the son of Hecuba and Priam, king of Troy. His wife was Andromache (*ān-drōm'ā-kī*), and his infant son was Astyanax (*ās-tī'ā-nāx*). He shared

HECTOR REPROACHES THE FRIVOLOUS PARIS



In this bas-relief by Thorvaldsen, the great Danish sculptor, Hector bitterly reproaches his brother Paris for remaining with Helen while the people perish in battle. "It is because of thee that war and its fury surround them," he cries.

the dangers of battle with his brothers, the bravest of whom was Deiphobus (*dē-īf'ō-būs*). How the brave Hector came at last to meet Achilles in combat is told in Homer's epic poem, the 'Iliad' (see Homer).

Farewell to Wife and Child

A few days before the combat, Andromache was standing high on the great tower of Troy, weeping to see her countrymen hard pressed by the Greeks. At her side stood a nurse holding the infant Astyanax.

Suddenly Andromache saw her husband, who had returned to the city to bid the elders and the women pray to the gods for help. She ran swiftly to meet him and with her went the nurse and the child. Claspings her hand in Hector's, she begged, "Have pity and stay here on the tower, lest you make your child an orphan and your wife a widow."

But Hector answered, "My soul forbids me to shrink from battle like a coward," and he stretched out his arms to his boy. The child cried and clung to the nurse, for he was frightened at the horsehair crest that nodded fiercely from his father's helmet of gleaming bronze. Laughing, the great warrior swept the helmet from his head, and taking his son in his arms kissed him and prayed to the gods that he might grow to be a great man. Then he placed the child in the mother's

arms, put on the towering helmet, and strode away. With the return of Hector to the battle lines, the sun-god Apollo befriended the Trojans. Thus, with the aid of the god, Hector killed Patroclus, Achilles' best friend. This stirred Achilles, who had been sulking in his tent for several days. He swore vengeance and went out to join the battle.

The Death of Hector

Once more, when Achilles entered the fight, the tide turned for the Greeks, and they swept the Trojans back to the gates of Troy. All fled to safety within the city's gates—all, except Hector. He stood outside and awaited Achilles.

Those watching from the city wall grew sick at what they saw. For some god struck terror into the heart of Hector. The bravest of the Trojans, he trembled at the sight of Achilles, clad in the armor which Hephaestus had made for him. Then Hector fled. Three times Achilles pursued him round the wall of Troy, but could not catch him, for Apollo gave miraculous speed to the Trojan champion.

The goddess Athena, who loved the Greeks, whispered to Achilles to stop and take breath. She promised to bring about his meeting with Hector. Then she went to Hector, and taking the shape of Deiphobus, his brother, said, "Wait, and we shall meet Achilles together. Thus shall you slay him."

Hector took heart and closed with Achilles. The Greek threw his spear, but Hector bent low and it flew past him. The goddess Athena returned the spear to Achilles, but Hector did not see this and, throwing his own spear, struck the shield of the Greek. The weapon glanced harmlessly from the god-made armor. Turning to seize a second spear from Deiphobus, Hector found him gone, and knew that a god had tricked him. So, certain that he must die, he drew his sword and rushed toward Achilles, but the famed warrior, spear in hand, bore down upon him like an eagle. With one thrust, Hector lay dead.

To take full vengeance for the death of Patroclus, Achilles fastened Hector's body to his war chariot, and dragged it round the wall of Troy. Andromache, watching from the wall, fell fainting into the arms of her maidens.

Ransom and Burial of Hector's Body

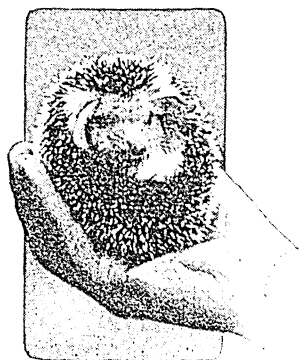
In his anger, Achilles long refused to give up Hector's body for any ransom. Aphrodite and Apollo, however, preserved the body from harm during the days it lay in Achilles' tent. Thetis, the goddess-mother of Achilles, at last told him that it was the will of the gods that he should give up the slain warrior. And so, in return for gifts of gold and rugs, mantles and cloaks and caldrons, Achilles gave up Hector's body to Priam.

There was a twelve-day truce while the Trojans mourned Hector. They burned the body of their slain hero on a lofty pyre, and buried his bones under a great mound of stones. "Thus held they funeral for Hector, tamer of horses."

Soon after the death of Hector, Troy fell before the Greeks and the long war ended (see Trojan War).

HECUBA (*hĕk'ū-bā*). In Greek legend, Hecuba was the wife of Priam, king of Troy. Among the 19 children she bore him were Hector, Paris, Cassandra, Troilus, and Deiphobus. When the Greek chieftains cast lots for the captive women after the Trojan War, Hecuba fell to Odysseus. According to one account, she afterward leaped into the Hellespont; according to another, she was stoned to death by the Greeks, whom she had violently angered by her bitter abuses.

HEDGEHOG. The hedgehog is found in many parts of Europe. As its name indicates, it dwells in hedges and thickets. It sleeps by day, and at night it roots in the mold with its pointed snout for such food as insects, snails, and eggs. When attacked it rolls itself into a ball, thus exposing no part of its body that is not defended by its sharp prickly spines. It passes the winter in partial or complete hibernation. The common hedgehog of Europe (*Erinaceus europaeus*) is about the size of a large rat. Other species exist which are even smaller.



This little hedgehog was frightened when he was picked up, and rolled himself into a tight ball. But now he's getting over his fright and peeking out.

No true hedgehogs live in America, but the name is sometimes applied to the porcupine of the United States and Canada, which resembles the true hedgehog in having a coat of stiff sharp spines.

HEDGES. These "fences of living green" are used for two purposes, defense and ornament. In the Old World they are still much used to protect fields in countries where wood is scarce, but in the New World they are rarely found except for ornamental planting.

No plant meets all the requirements of farmers for an absolutely impassable barrier, although the Osage orange (*Machura aurantiaca*) was widely planted at one time in the United States. Next to this, probably, ranks the honey locust (*Gleditsia triacanthos*), with its spiny trunk and branches, and its large flat ornamental pods, whose sweet pulp gives the tree its name. The hawthorn of Europe (*Crataegus oxyacantha*) is subject to many fungous growths and is consequently not planted to any extent in America. A thorn hedge requires constant attention, for it must be kept free from weeds and pruned regularly.

The California privet (*Ligustrum ovalifolium*) is a general favorite where the winters are not too severe, as it holds its leaves nearly all winter and grows so close after repeated pruning as to form an almost impenetrable barrier.

Among the evergreens used for hedges the Norway spruce (*Picea excelsa*) is a great favorite. Next perhaps ranks the American arborvitae (*Thuja occidentalis*), often incorrectly called white cedar, with its

short horizontal branches ascending at the end, and the common hemlock (*Tsuga canadensis*), the only one of the hemlocks that bears pruning well. The boxwood (*Buxus sempervirens*) is much used in the old formal gardens of Europe, and is sometimes trimmed in most fantastic shapes.

Many deciduous trees and shrubs also can be used for ornamental hedging. The flowering shrubs are especial favorites. Some of the most common are the varieties of *Spiraea* (bridal wreath), the Japanese rose (*Rosa rugosa*) which bears its single flowers all through the summer, the common lilac (*Syringa vulgaris*), and the great panicle hydrangea (*Hydrangea paniculata*). Several species of barberry (*Berberis*) are beautiful and hardy, especially the charming *Berberis thunbergii*, with its low dense growth, its brilliant autumnal tints, and the abundant scarlet berries which remain fresh until the following spring. Many species of barberry, however, are under ban owing to the enormous injury they do in harboring the rusts which blight the wheatfields (see Rusts and Smuts).

HEIDELBERG (*hî'dl-bêrg*), GERMANY. Nestling between a wooded height and the beautiful Neckar River, which here leaves its gorge to enter the plain of the Rhine, this quaint university town is one of the most picturesque and interesting spots in Germany. The old city consists principally of a long narrow street following the course of the river for about two miles. It grew up at the foot of the castle begun in the 12th century, which crowns the wooded height in the background. Added to at different periods the castle became one of the largest and grandest in Germany; but it was largely destroyed during the devastating wars of Louis XIV of France, and though later rebuilt, it was struck by lightning and again ruined in 1764. But its ivy-clad ruins are still beautiful, and in an old cellar beneath the castle is the great "Heidelberg tun," an enormous wine cask capable of holding 49,000 gallons. The terrace commands a magnificent view of the surrounding country. Heidelberg University, which has been the alma mater of many noted scholars, was founded in 1385, and it is the oldest of German universities. Formerly the capital of the Palatinate, Heidelberg passed to the former grand duchy of Baden in 1803. Population, about 75,000.

HEINE (*hî'nê*), HEINRICH (1797-1856). "I am a Jew—a Christian. I am tragedy—I am comedy." This is what the most gifted poet in the Germany of his century said about himself. Heine was indeed a man of puzzling contradictions and inconsistencies, a true poet and a splendid journalist, a historian without method, a philosopher without a real philosophy, a hater of despotism and an ardent admirer of Napoleon, a cynic who laughed at sentiment, but was himself a sentimentalist. He was born of Jewish parents in Düsseldorf, in western Germany, but later joined the Lutheran church in order to practice his profession of law, which he had studied at the universities of Bonn and Göttingen.

Heine's heart, however, was in literature, not in law. During a visit to a wealthy uncle, his lifelong benefactor, he fell in love with a very beautiful cousin. His spurned love found expression in exquisite poems which were published and created a sensation in Germany. His outspoken liberal views together with his intense admiration for Napoleon made him feel uncomfortable in reactionary Germany. This disappointment in love and his political opinions combined to send him to Paris, where he felt at home.

Although Heine wrote much about philosophy, literature, and politics, his fame rests on his poems. Many of these lyric gems have achieved the popularity of folk-songs, and with good cause, for they have the true folk-song qualities. They are simple and full of warmth, and have the freshness and melody of the skylark's note. Almost every German man, woman, and child knows several of Heine's poems by heart. Some of them, such as 'The Lorelei' and the 'Two Grenadiers', are universally famous. His songs have been set to music by many famous composers. The capricious quality that pervades all his writings lurks even in his most tender poems. He shifts from intense passion to careless mockery. One of his delightful poems, 'My Child, We Once Were Children', pictures two children playing house in the courtyard and entertaining company, amongst them the neighbor's cat; and the sweet, pensive mood of the poem is broken by the satiric stanza:

Politely we asked how her health was,
In the course of a friendly chat.
(We've said the same things since then
To many a grave old cat.)

But it is in his prose writings that Heine's most sardonic flashes of wit appear. The 'Travel Pictures', the most popular of all of Heine's prose writings, strikes a new and fresh tone and is full of sparkling wit. The prologue rings out mockingly at the "laundered bosoms," "polished salons," and "oily speeches."

The nervous headaches of his university days at length developed into a disease of the spine which resulted in paralysis. This strange man of contradictions, who had been impatient and irritable in health, showed remarkable endurance and cheerfulness in the long years spent on what he termed his "mattress grave." He died and lies buried in Paris.

Heine is perhaps best known to American readers by his poem entitled 'The Lorelei', familiar to us as a German song. The poem suggests that dreamy time just before the approach of twilight. The sunset in a burst of glory lights up the mountain peaks. A boatman is returning home on the Rhine; he looks up and beholds a glorious sight:

On yonder height there sits
A maiden wondrous fair,
Her golden jewels sparkle;
She combs her golden hair;
With comb of gold she combs it
And sings, so plaintively,
A strain of wondrous beauty,
A potent melody.

Drawn by the enchanting power of her song, the boatman gazes upward at the beautiful maiden and fails to see the dangerous rocks below. Suddenly there is a crash, and boat and boatman are lost in the waves.

In this story Heine makes use of an old legend which had grown up about a high and dangerous rock on the bank of the Rhine, called the Lorelei or "elf-rock." It is at a narrow part of the river, about 23 miles south of Coblenz, near St. Goar. The rock has a remarkable echo, and it is from this probably that the legend of the enchanting song arose.

HELGOLAND. "The Gibraltar of the North Sea," Helgoland lies about 28 miles from the mainland of Germany, northwest from the mouths of the Elbe and Weser rivers. It is the farthest seaward of the Frisian Islands. Red sandstone cliffs 200 feet high face the sea on all sides of this triangular island. The constant pounding of the waves is gradually eating it away. Surrounding rock ledges show that the original size was five times as great as the present, which is somewhat over 100 acres. The inhabitants, mostly Frisian fishermen, number about 2,500.

Germany, in 1890, got it from England in exchange for concessions in East Africa. The Germans turned the island into a powerful fortress, with long-range guns to guard the entrances to the Elbe and the Weser and the western end of the Kiel Canal. It was also a naval base in the first World War. By the peace terms of 1919, Germany dismantled the fortifications on the island, but in 1936 began rebuilding its defenses. Once more an important strategic point, it was heavily bombed by the British Royal Air Force during the second World War.

HELIOTROPE. "The flower enamoured of the sun" is what the poet Thomas Moore called the dainty heliotrope, which got its name from the Greek words *helios* (sun) and *trope* (turning) because its one-sided spikes of small fragrant flowers were supposed always to turn toward the sun. In the 18th century a French botanist sent some of its seed from Peru to the royal garden at Paris, where, according to chroniclers, women "welcomed it with enthusiasm, according to their most precious vases, naming it the 'flower of love', and receiving with indifference all bouquets in which their favorite found no place."

Many wild species of these hairy many-branched shrubs are found in the warm and temperate regions of the world, and many cultivated varieties give an added charm to greenhouses and gardens. They grow from one to two feet high, with flowers varying in color from purple to violet and even white. Because of their vanilla-like odor the flowers are used in making perfume and sachet powder.

The heliotrope is a genus (*Heliotropium*) of the borage family (*Boraginaceae*) which has about 220 species in the temperate and warmer parts of both hemispheres. The Peruvian heliotrope (*Heliotropium peruvianum*) is the most common. The lance-shaped leaves are alternate and petioled; the tiny flowers grow in one-sided curved spikes; the calyx is five-parted, the corolla salver-shaped.

HELIUM. Before scientists knew that the gas helium existed on earth, they had discovered it with the spectroscope on the blazing surface of the sun—hence its name, from the Greek *helios* meaning "sun." Strangely enough, this namesake of the hottest body known to man has since been used to produce the most intense cold ever observed. Helium under great pressure, cooled with liquid air and liquid hydrogen, itself becomes liquid at -452°F. , and when this liquid helium evaporates an even more intense cold (-456°F.) is produced, freezing the liquid (*see Heat*).

Helium is the lightest of inert gases—that is, those that refuse to combine chemically with other substances. Because it will not burn it is especially adapted for use in balloons instead of hydrogen, which is highly inflammable. In the World War of 1914–1918 the United States attempted to produce this gas in quantities for this purpose. Up to 1915 the world's total output of helium was probably less than 100 cubic feet, and its market value was about \$1,700 a cubic foot. The United States has practically a monopoly on helium production, with natural gas containing helium in workable amounts in seven states, but there are also deposits in Canada and elsewhere. The government plant near Amarillo, Tex., controls gas rights that will supply helium for the United States army and navy aircraft for many years. Helium is separated by liquefying all other constituents at a temperature of about -300°F. , produced by evaporation and refrigerating. It costs one cent or less a cubic foot.

Helium, mixed with oxygen, saves divers from "the bends," or caisson disease, in which nitrogen, dissolved in the blood under unusually high pressure, forms bubbles when suddenly released. The helium-oxygen mixture allows increased pressure, so divers may go to greater depths. Helium is also used in magnesium welding to shield the metal from the air and prevent it from bursting into flame. (*See Radium*.)

HEMLOCK. Its plumelike and drooping branches and short flat blunt needles, whitened beneath and appearing two-ranked, afford a sure means of distinguishing this beautiful evergreen tree from its relatives, the pines, the firs, and the spruces. The tiny oval brown cones hanging from the branches are usually only about half an inch long. When the tips of its dark-green sprays are all alight with the yellow-green of the new leaves in spring, the hemlock is one of the most picturesque of American trees.

Hemlocks are tall and pyramidal in shape; they grow to an average height of 60 or 70 feet. With the growing scarcity of pine, the wood has come to be used extensively in interior decoration, although it is soft and warps when exposed to the air. The bark is extensively used in tanning.

There are two chief species: the Canadian hemlock, found in eastern Canada and in the United States as far south as Georgia and as far west as Minnesota; and the western hemlock, found on the Pacific coast and as far east as Montana.

The name hemlock is also applied to certain poisonous plants of the parsley family, which are widely distributed over the United States and Canada. The water hemlock (*Cicuta*), which is also called wild

for making coarse cloth (see Jute). But hemp is still used widely for making strong and durable twines, high-grade belting and webbing, and oakum and other kinds of packing. Oil from the seeds is used in making soaps, paints, and varnishes. The seeds are also fed to birds.

THE CANADIAN HEMLOCK



On the right is the trunk of the Canadian Hemlock. On the left are hemlock branches with their short, flat, blunt needles, their oval cones, and their winged seeds that help the Hemlocks to march into new territory, and to climb high up the mountain sides.

parsnip, grows in marshy places. It is one of the most poisonous plants of North America. The poison hemlock (*Conium*) grows in dry places. This is supposed to be the plant from which the ancient Greeks obtained the poison they used to execute criminals.

Scientific name of Canadian hemlock, *Tsuga canadensis*; western hemlock, *Tsuga heterophylla*. Bark reddish or gray, becoming furrowed with age. Leaves linear, $\frac{1}{2}$ inch long; growing singly and opposite each other. Cones very small and thin-scaled. Fruit, winged seeds.

HEMP. This plant serves the wise and destroys the foolish. Its fibers make valuable textiles, but its sap yields a dangerous narcotic drug, called "hashish" or "marihuana."

Hemp has been cultivated for thousands of years in its native Asia and was long ago carried to many other regions of the world. For centuries it was one of the most important textile fibers. Rope, coarse cloth, and the sails of ships were made of it. The very name canvas probably comes from the Latin word *cannabis* for "hemp," though canvas now is usually made of cotton.

The Cavaliers at Jamestown and the Pilgrims at Plymouth early planted hemp and from it wove their homespun clothes. From hemp were woven also the tops of covered wagons that carried pioneers into the West.

Today hemp is little used for rope, because of competition from abaca (manila hemp), which is lighter and more resistant to water. Jute has replaced hemp

The fibers of hemp come from the inner bark of the woody stalk. Before they can be recovered, the plant must "ret" or rot on the ground after it has been cut. The stalks are then shocked, and finally they are crushed to separate the fiber from the wood of the stem. Crushing in hand brakes is a tedious and laborious task; 100 pounds of cleaned fiber is a good average day's work for a man. All the operations from harvesting to the removal of the fiber can now be performed by machinery, as shown on the opposite page.

The production of hemp for its fiber is an important industry in China, India, Russia, Italy, Hungary, and Poland. In the United States hemp is a minor crop, and production is confined mainly to Kentucky, Wisconsin, and Illinois. In Kentucky it was once one of the chief crops, but it is now of little economic importance there (see Kentucky). The United States imports the greater part of its supply.

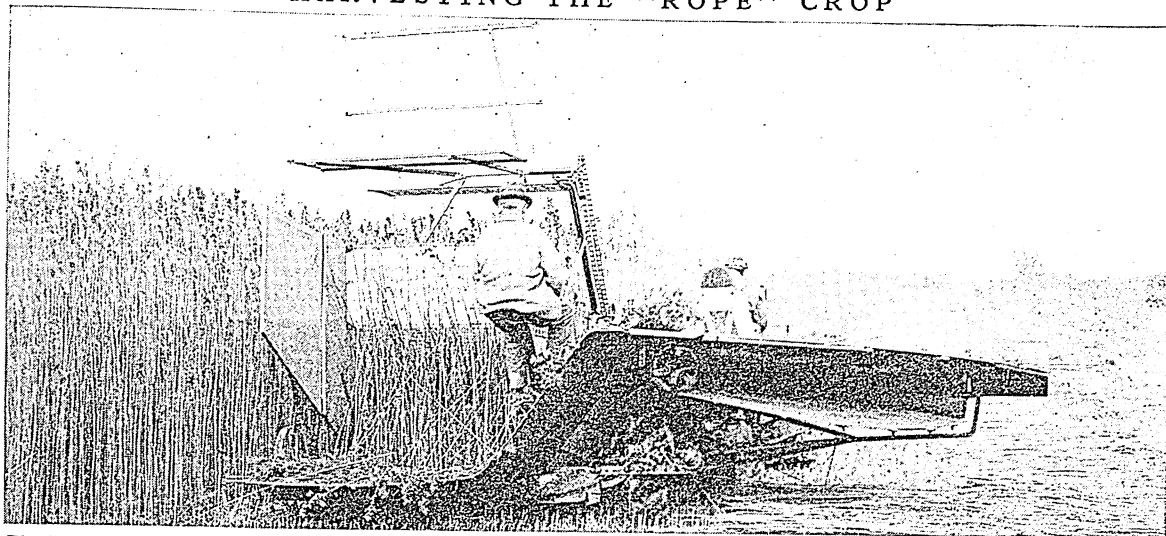
A resinous substance in the leaves, stems, and flowers of certain types of hemp is the source of hashish, which is called "marihuana" in Mexico. This has been used as a

drug since ancient times. It has a sinister effect upon habitual users, and many commit crimes while under its influence (see Assassins; Narcotics). The Federal government classifies marihuana as a narcotic drug and coöperates with other nations to regulate its distribution and to prevent its abuse.

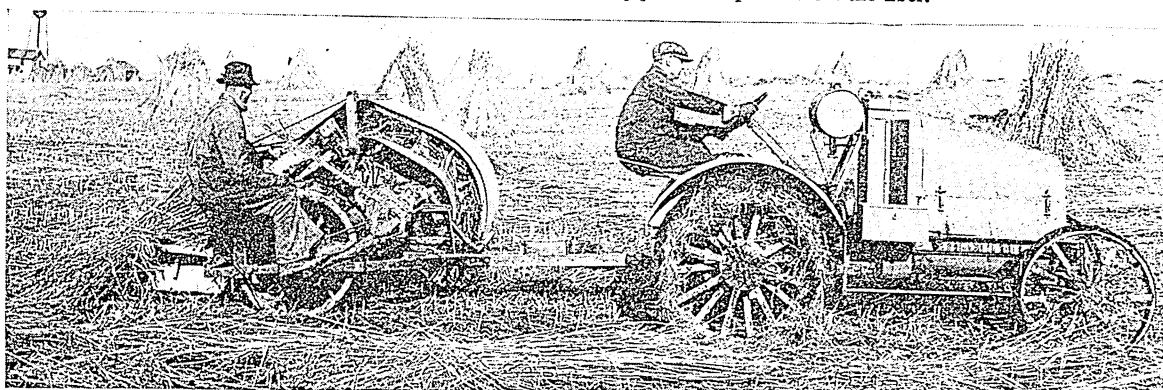
The term hemp is also used to designate many kinds of fiber in no way related to the hemp plant—among them manila hemp, sisal hemp, and the Sunn hemp of India. Manila hemp (abaca) comes from a plant of the Philippines which belongs to the banana family. Its fiber is long (from 6 to 12 feet), strong, and durable. Abaca is used in making ships' cables and other kinds of rope where great strength and flexibility are required, as well as the best grades of binder twine. Sisal and the closely related henequen are used in the manufacture of binder twine and other hard fiber twines, and ropes of small diameter. (See Sisal.)

All cultivated true hemp is produced from *Cannabis sativa*. This is an annual herb of the mulberry family varying under cultivation from 3 to 16 feet in height and having angular rough stems and alternate deeply lobed leaves. Male and female flowers grow on separate plants, the female plant being taller and more luxuriant and having darker foliage than the male. Manila hemp comes from the *Musa textilis*. (See Rope and Twine.)

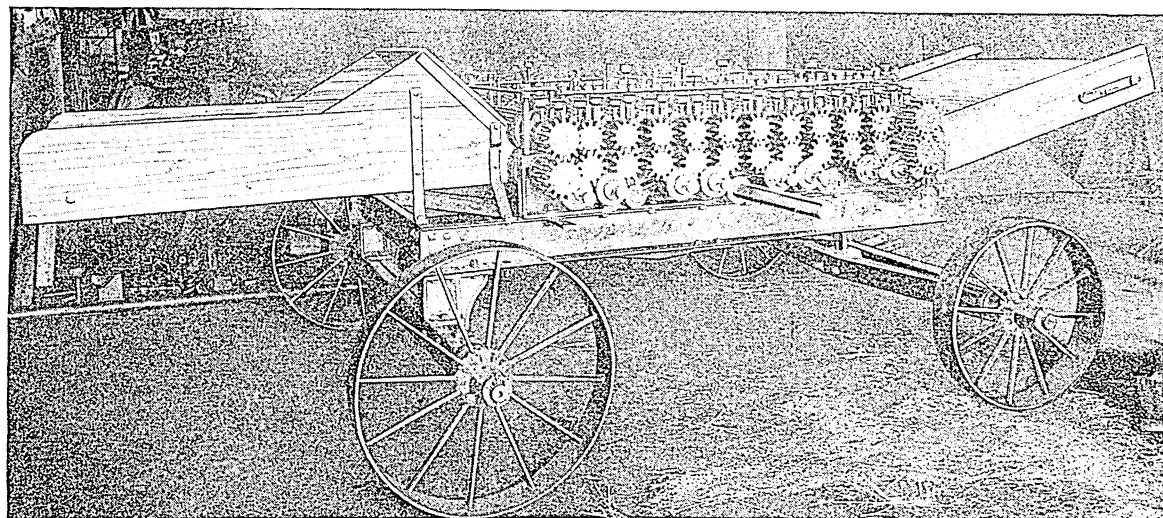
HARVESTING THE "ROPE" CROP



The hemp harvesting machine cuts an even swath, passes the stalks up to the table on the right of the driver, and from there distributes them over the ground in even windrows. They lie in this way on the ground until they have been "retted," that is, decayed by moisture and exposure so that the woody portions separate from the fiber.



This machine gathers the hemp stalks from the windrows and ties them into bundles ready to be shocked. Notice the shocks already set up in the background.



This complicated gear-driven machine separates the hemp fiber from the woody portion of the stalks. The rollers of the machine are fluted so they will properly crush the stalks as they pass through. Once crushed, the stalks pass on to the "scutcher" which combs out the fiber from the woody pulp.

HENNEPIN, Louis (1640?-1706?). "Anybody but me," boastingly writes Father Hennepin, "would have been very much frightened at the dangers of such a journey as that upon which La Salle now dispatched me." This journey was to be from Fort Crèvecoeur, near the present site of Peoria, Ill., down the Illinois River to the Mississippi, and thence up the Father of Waters towards its source.

The man to whom was confided this undertaking was a Franciscan monk from Belgium. He had come to America in 1675 on the same ship that brought La Salle. Love of adventure and religious zeal led him to become a missionary to the Indians, and in 1678 he was overjoyed when he was given permission to accompany La Salle on his great trip of exploration.

Two years later he set out on his dangerous journey from Fort Crèvecoeur. And dangerous it proved, for Father Hennepin and his two companions were captured by the Sioux Indians and carried in canoes up the Mississippi. While in the northern country Hennepin discovered the falls in the Mississippi where Minneapolis now stands. He named them the Falls of St. Anthony, after his patron saint, St. Anthony of Padua.

Soon Hennepin was released by the Sioux, and returned to Quebec and thence to France. There he published his 'Description of Louisiana' on which his fame rightfully rests. Unfortunately, some years later, after the death of La Salle, Hennepin published another book in which he claimed that he also went down the Mississippi and discovered its mouth before La Salle made his memorable journey. This falsehood has greatly dimmed the glory which rightfully belongs to Father Hennepin, because for many years people were afraid to trust his first accounts of what he really had done.

HENRY, HOLY ROMAN EMPERORS.

Seven rulers of this name are counted in that union of Germany and Italy which is called the Holy Roman Empire (see Holy Roman Empire). **HENRY I**, "the Fowler," was king of Germany from 919 to 936, but never concerned himself with Italy and his power even in Germany was weak outside of Saxony. **HENRY II**, called "the Saint" (reigned 1002-1024), was the last of the Saxon house; he made three expeditions into Italy and was an earnest supporter of church reform. **HENRY III** was a member of the Salian line, and in his reign (1039-1056) the kingdom of Burgundy was added to the empire.

HENRY IV (reigned 1056-1106) succeeded his father, Henry III, when he was less than six years old. He grew up wilful and headstrong amid bitter contests over the regency. A few years after he took power into his own hands the storm of the Investiture conflict broke and lasted far into the reign of his son. The question was whether the Pope or Emperor—

THE EMPEROR HUMBLER HIMSELF BEFORE THE POPE



When Emperor Henry IV defied Pope Gregory VII, his people revolted, and he was forced to journey across the Alps in the dead of winter to obtain the Pope's pardon. Here we see him at Canossa, after he had been kept waiting without food for three days, ascending the steps barefooted and in penitent's robe to kneel at Gregory's feet.

church or state—should control the appointment of bishops and other high clergy, who were not only high officers of the church but great feudal princes exercising power in the state as well.

In 1077 revolts in Germany forced Henry IV to cross the Alps into Italy in the dead of winter, and abase himself before the Pope, Gregory VII, at Canossa. Only after standing three days in the courtyard, fasting and barefoot, was he admitted

and the Pope's excommunication raised, on hard conditions. It was the most brilliant victory that the papacy ever won over the temporal power. It proved, however, to be only an incident in a long struggle which outlasted both Henry and Gregory. (See Gregory, Popes).

HENRY V (reigned 1106-1125) joined his father's enemies in 1104, and the elder Henry died in defeat at Liège, in what is now Belgium. The son, when once seated on the throne, became as staunch an upholder of the imperial claims as his father. In the Concordat of Worms (1122) the Investiture conflict was ended by a compromise, which guarded the just rights of both parties. Henry V died without children, and the throne then passed to the Hohenstaufen House.

HENRY VI (reigned 1190-1197) was the third of the Hohenstaufen line, the able son of the great Frederick Barbarossa and the father of Frederick II, "the wonder of the world." (See Frederick, Emperors). The chief event of his short reign was his acquisition by marriage of the Norman kingdoms of Sicily and Naples.

HENRY VII (reigned 1308-1313) was the last emperor who sought to obtain the claims and traditions of the medieval Empire. He died in Italy, frustrated in his attempts to restore any effective union of Italy and Germany.

HENRY, KINGS OF ENGLAND. Eight Henrys have sat on the English throne since this name was first introduced into the royal line in the person of Henry I, youngest son of the Norman conqueror; and all except two of these royal Harries (Henry III and Henry VI) were among the ablest sovereigns of that island kingdom. But the disfavor created by the crimes and oppressions of the last of the series—the tyrannical Henry VIII, father of the great Elizabeth—was so great that no English sovereign since his time has borne this formerly popular name.

HENRY I, who reigned 1100-1135, was called "Beauclerc" because, unlike most princes of that age, he was a "good scholar." He is credited with saying that "an unlettered king is only a crowned ass." During the 35 years of his reign England enjoyed peace and prosperity. The chronicler of those times wrote that he "was a good man and great was the awe of him; no man durst ill-treat another in his time."

At his accession Henry I issued a famous "Charter of Liberties" which became the basis of Magna Carta, the foundation of the liberties of the Anglo-Saxon world. He also favored the church in order to win its support against the pretensions of his elder brother Robert, who claimed the English throne in addition to the duchy of Normandy left him by their father. The English were conciliated by his marriage with Matilda, a descendant of the Anglo-Saxon kings. And the support of the common people was assured by his repression of the Norman nobles and by the justice he administered through the "King's Court." The "Lion of Justice," he was called.

One misfortune darkened Henry's later years. His only son was drowned when the *White Ship* sank in the English Channel, and, according to the story, the king "never smiled again." This accident left his daughter Matilda and his nephew Stephen contestants for the throne at his death (see Stephen, King of England).

Great Work of the First Plantagenet King

HENRY II, 1154-1189, was the son of Matilda, and the grandson of Henry I. His father was Geoffrey of Anjou, called "Plantagenet" from his habit of wearing a sprig of the broom plant (*planta genista*) in his cap; so with Henry II, in 1154, the first Plantagenet king ascended the English throne. Two years before he became king, as a lad of 18, Henry had led an army from France to assert his mother's claim, and the wearied Stephen



HENRY II

The First of the Plantagenet Kings

had agreed to a treaty by which Henry was recognized as his successor.

Henry II was the most powerful prince in Christendom. In addition to England and Normandy which he held by his mother's right, he inherited from his father, as French fiefs, the important counties of Anjou, Maine, and Touraine, and by his marriage with Eleanor of Aquitaine he acquired Poitou, Guienne, and Gascony, so that he held most of the British Isles and about one-half of France. Frequent wars with his suzerain the French king followed, in which his rebellious nobles took unsuccessful part against him.

Henry II re-established law and order after the anarchy of Stephen's reign. He improved the military service by permitting the barons to pay "scutage" or shield money in place of serving in the army; with this he hired soldiers who would fight whenever and wherever he wished—an important means of keeping in order the powerful nobles of the land. But his greatest work was the reform of the law courts. The Curia Regis was brought into every part of England by sending learned judges on circuit through the land to administer the "king's justice," so that gradually one system of law took the place of the many local customs that had been in use. He also established the "grand jury" by which accusations could be brought by a body of representatives of the community against evildoers who were so powerful that no single individual dared accuse them. To him also we owe the growth of the "petty" or "trial jury," especially in cases relating to land; this substituted the weighing of evidence and testimony by

sworn men for the old superstitious trial by battle or by ordeal. Henry even attempted to bring churchmen who committed crimes under the king's courts, but the scandal caused by the murder of Archbishop Thomas Becket in the course of this quarrel forced him to give up this reform (*see* Becket, Thomas).

Henry's last years were embittered by the rebellion of his sons, aided by Philip Augustus of France and by their mother, the unscrupulous Eleanor. The king, old, sick, and discouraged, had to consent to the terms demanded of him. When he saw the name of John, his favorite son, among those of his enemies, he exclaimed, "Now let all things go as they will; I care no more for myself, nor for the world." Two days later he died muttering, "Shame, shame on a conquered king."

HENRY III, 1216-1272, son of King John, was a religious man and a good husband and father, but he was a weak and incompetent ruler. Until he became of age officers trained under his grandfather, Henry II, directed affairs, and good order and prosperity prevailed. When Henry III took the administration into his own hands, he squandered the revenues of the kingdom on greedy relatives and favorites. The nobles seized upon his misgovernment as an excuse for rebellion in the Barons' Wars, under the leadership of the patriotic Simon de Montfort (*see* Montfort, Simon de). After Simon was defeated and slain in the battle of Evesham (1265), the people looked to the king's son, Edward I, for good government, and during the last seven years of Henry's reign the country was quiet and prosperous, the king being guided largely by the advice of his gifted son, Prince Edward.

The Lancastrian Henrys

HENRY IV, 1399-1413, founder of the royal House of Lancaster, landed in England from unjust exile with only 60 followers. The 60 soon became 60,000, for all classes of people were tired of the mingled weakness and tyranny of Richard II, grandson and successor of Edward III, and he was now deposed and imprisoned. And Henry IV, claiming descent "by right line of blood from the good King Henry III," was seated on the throne by Parliament. But throughout his reign of 14 years his position was insecure and trying. The claim later asserted by the House of York was felt to be a better hereditary title to the throne than that of Lancaster. Scotland was restless, newly conquered Wales broke into open revolt, and the powerful family of the Percies, to whose aid Henry IV owed much in gaining the throne, took arms under the famous "Hotspur." So Henry perforce was obliged to keep on good terms with the church, and to permit the newly arisen Parliament to exercise powers in the government which became a

notable precedent in later struggles between Crown and Parliament. Shakespeare represents him as speaking these words on his death bed to his son and successor, Henry V:



HENRY IV
Founder of the House of Lancaster

Heaven knows, my son,
By what by-paths, and indirect crook'd
ways,
I met this crown; and I myself know well,
How troublesome it sat upon my head:
To thee it shall descend with better quiet,
Better opinion, better confirmation;
For all the soil of the achievement goes
With me into the earth. . . .

HENRY V, 1413-1422—the former madcap "Prince Hal" of Falstaff's companionship in Shakespeare's scenes—proved the hero-king of England. As king he "put away childish things," and was sober, clearheaded, and vigorous, so that he acquired the reputation of being "the most virtuous and prudent of all the princes reigning in his time." He followed his father's advice to "busy giddy minds with foreign quarrels" by putting forth again the claim to the French throne, formerly raised by Edward III, thereby renewing the Hundred Years' War (*see* Hundred Years' War). By his brilliant victory at Agincourt (1415) he conquered all the northern half of France, and by a treaty five years later he married Princess Katherine of France, and it was agreed that he should become king of France also after the death of her father, the insane Charles VI. In the midst of his victories, Henry V died of camp fever, leaving as heir to his rights in both kingdoms his infant son Henry, nine months old.

HENRY VI, 1422-1461, was one of the most unfortunate kings who ever sat on a throne. While he was still a baby his uncle, the Duke of Bedford, ruled for him, and for a time maintained and even extended the English conquests on the continent. Then the French were aroused by Joan of Arc, who raised the siege of Orleans and brought the young French king, Charles VII, to Reims to be crowned (*see* Joan of Arc).

Matters did not mend for the English when Henry VI grew to manhood. He was truthful, upright, and just, but he had neither the strength of mind nor of body to rule a kingdom, and for long periods he was insane like his French grandfather. War and business were never to his liking; he would rather have lived the life of a monk. So bit by bit the English lost the lands which they held in France, until only the city of Calais was left to them when the long Hundred Years' War ended, in 1453.

Meantime the misgovernment of Henry's ministers at home led to a rebellion under Jack Cade, in 1450, in which London was taken before the insurgents were overpowered and their leaders executed. Five years later began the bloody and merciless Wars of the Roses. In these Queen Margaret, Henry's French

KING HENRY'S PRAYER BEFORE THE BATTLE OF AGINCOURT



The bearded warrior in the foreground with his hands folded is Henry V. He has drawn up his small army to receive the blessings of the priests, before giving battle to the French. Men, horses, and the torn flag tell of the hard campaigns they have been through. A few hours after the scene depicted here, the English had gained one of the most brilliant victories in their history, and Henry had made himself master of northern France. This is a reproduction of a famous painting by Sir John Gilbert, which hangs in the art gallery of the Lord Mayor's mansion in London.

wife, was the real head of the Lancastrian party, and King Henry played only a feeble part. But in the course of the contest he lost his throne to the Yorkists, his young son Prince Edward was slain, and the king himself was finally murdered in the Tower of London, where he was imprisoned. (See *Roses, Wars of the*.)

The Founder of the Tudor Line

HENRY VII, 1485-1509, who claimed descent from the Lancastrian House, gained the throne by overthrowing the last of the Yorkists. When the battered crown of the usurper Richard III was picked up on Bosworth Field and placed on the head of Henry Tudor, this seventh Henry, the Wars of the Roses ended, and with them the Middle Ages in England. He was the first modern king of that land. He united the houses of Lancaster and York by marrying Elizabeth of York, niece of Richard III. War had no place in the policy of this Tudor king, who was called the "Solomon of England" and was regarded as the craftiest and stingiest prince of his time. Abroad he secured his aims by treaties and by the marriage alliances of his children. At home he increased his power by forbidding the great nobles to

maintain lawless bands of followers, and by compelling them to obey the laws by means of his famous Court of Star Chamber (*see* *Star Chamber*). He thus laid the basis of that powerful Tudor monarchy, as it came to his son Henry VIII, and the great Elizabeth.

Henry VII is also to be remembered because in his time the Renaissance (*see* *Renaissance*) was established in England. William Caxton had introduced printing into England shortly before this; and it was John Cabot, sailing by permission of Henry VII, who laid the foundation for England's claim to Newfoundland and the mainland of North America.

HENRY VIII, 1509-1547, was educated in the New Learning, and—before the death of his elder brother Arthur made him heir to the throne—was intended for the archbishopric of Canterbury. He was a gay and handsome youth, well skilled in all manner of athletic games, though in later life he became coarse, fat, and ungainly. For nearly 40 years he ruled England with a strong hand and brought about one of the most far-reaching changes ever effected in the institutions of any kingdom. For motives of policy

he was betrothed to his brother's girl widow, Catherine of Aragon. During the first 20 years of his reign he left the shaping of policies largely in the hands of his great counselor, Cardinal Wolsey, who sought to give England importance by acting as an arbiter between warring Spain and France. On one occasion Henry took part in France in the gorgeous display of the "Field of the Cloth of Gold," where he and the young French king, Francis I, met to wrestle, dance, watch tournaments, and talk of international relations and policies.

At the end of this period Henry professed doubts as to the power of the Pope to grant him the "dispensation" which the laws of the church had required in order that he might marry his brother's widow. Perhaps these doubts were strengthened by the fact that the only one of Queen Catherine's children to live was a sickly girl—the Princess Mary—and it was doubtful whether a woman could succeed to the English throne. Then, too, Henry had grown tired of Catherine and had fallen in love with a young lady of the court named Anne Boleyn.

When the Pope would not annul his marriage, Henry in furious anger turned against his faithful minister Wolsey, deprived him of his office of Chancellor, and had him arrested on a charge of treason (see Wolsey, Cardinal). He then obtained a divorce from Thomas Cranmer, whom he appointed Archbishop of Canterbury for the purpose, and it was soon announced that he had married Anne Boleyn. The Pope was thus defied. All ties that bound the English church to Rome were broken. Appeals to the Pope's Court were forbidden; all payments to Rome were stopped; and the Pope's authority in England was abolished. By an act of Parliament, Henry himself was declared "Supreme Head of the Church of England," and to deny this title was made an act of treason. Some changes were also made in the church services, and the Bible translated into English and printed copies placed in the churches. The monasteries throughout England were dissolved and their vast lands and goods turned over to the king, who in turn granted those estates to noblemen who would support his policies. In the northern part of the kingdom the people rose in rebellion in behalf of the monks, but their "Pilgrimage of Grace," as it was called, was put down with bloody cruelty.

Although Henry reformed the government of the church, he refused to allow any changes to be made in its doctrines. Before his divorce he had opposed the teachings of Luther in a book which had gained for him from the Pope the title "Defender of the Faith"—a title the kings of England still bear. And

after the separation from Rome he persecuted with equal severity the Catholics who adhered to the government of Rome, and the Protestants who rejected its doctrines.

With equal bloodthirstiness he put to death every possible claimant to his throne. Among other victims whom he sent to the block were two of his wives, for he was married six times. You may perhaps have heard the old jingle:

King Henry the Eighth to
six wives was wedded.
One died, one survived,
Two divorced and two be-
headed.

Anne Boleyn bore the
king one child, the famous
Elizabeth; then she lost

his regard and was put to death. A few days later Henry married his third wife, Jane Seymour, who died in a little more than a year, after having given birth to the future Edward VI. A marriage was then contracted with a German princess, Anne of Cleves, whom the king had been led to believe to be very beautiful. When he saw her he discovered that he had been tricked; and he promptly divorced this wife and beheaded Thomas Cromwell, the minister who had arranged the marriage. His fifth wife, Catherine Howard, was sent to the block for misconduct. But the sixth one, tactful Catherine Parr, managed to survive this royal Bluebeard and lived to marry her fourth husband.

HENRY, KINGS OF FRANCE. Four kings of France have borne the name of Henry, of whom the last was the greatest. HENRY I, who ruled 1031-1060, was a contemporary of William the Conqueror, of England, and was defeated by that invincible warrior when he attempted to assert his authority over the duchy of Normandy. Under HENRY II (1154-1159) began the religious persecution of the Huguenots, which laid the fuse for the religious wars after his death. He died in a tournament, when a splinter from a lance entered the eye-hole of his helmet and penetrated to his brain; in this, Protestants saw the hand of Providence. The utterly worthless HENRY III (1574-1589), the last of the three weak sons of Henry II and Catherine de Medici, was for a brief period



HENRY VIII
England's Royal Bluebeard

elective king of Poland before he succeeded to the throne of France. His death by an assassin's hand, in the course of the Huguenot wars, opened the succession to his Protestant rival, Henry of Navarre.

HENRY IV, king of France and Navarre, who reigned from 1589 to 1610, was the last and greatest of the Henrys. He was king not only of France but also of the small independent kingdom of Navarre, on the northern slope of the Pyrenees. In 1569, when he was 16 years old, his mother, Jeanne d'Albret, the Huguenot queen of Navarre, placed him in the care of Admiral Coligny, the brave Huguenot leader (see Coligny, Gaspard de). From that time until his accession as king of France, Henry of Navarre was the recognized leader of the Huguenot party; but, for a short time after his marriage to the king's sister, Margaret of Valois, and the subsequent massacre of St. Bartholomew's Day, he seemed to renounce the Protestant faith in his tolerant easy-going way.

At the death of Henry III, in 1589, Henry of Navarre was the heir to the throne of France. But his right of succession was disputed by the powerful Catholic League, aided by the king of Spain, and he was not crowned until he had enforced his claim by arms and had become a member of the Catholic church. The victory was practically won at the battle of Ivry, in 1590, which Macaulay has rendered famous by his poem of that name, beginning—

Now glory to the Lord of Hosts, from whom all glories are!
And glory to our Sovereign Liege, King Henry of Navarre!

Henry IV also set about restoring the prosperity of the land. "My wish," he said, "is that every peasant in the kingdom should be able to have a chicken in the pot for his Sunday dinner." Agriculture and manufacture were encouraged by him, and roads repaired so that commerce might be benefited.

The improvement in the condition of the people, in which he was aided by his great minister the Duke of Sully, and the agreeable personality of Henry IV, the first of the Bourbon kings, combined to render him the most popular king France has ever had. He was struck down by the dagger of a religious assassin, as he was riding through the streets of Paris, leaving the throne to his young son, Louis XIII.

Although he conformed to the Catholic church, Henry IV did not forget the claims of his former religious associates. The Edict of Nantes, which he issued in 1598, gave the Huguenots equal political rights with Catholics; the right to reside freely anywhere in France; freedom of private worship in their

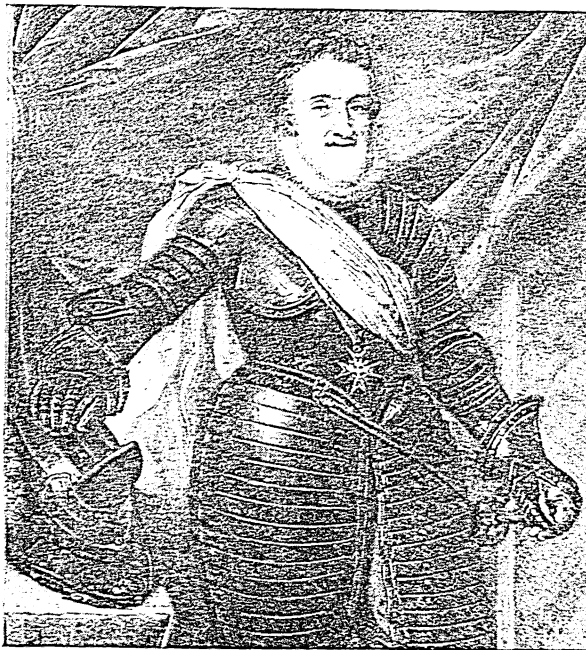
own homes, and public worship in certain places (not including the king's court or within five leagues of Paris); and the government of La Rochelle and a few other strong places as "cities of refuge." This edict remained in force, with some modifications, for nearly a hundred years (see Louis, Kings of France).

HENRY, PATRICK (1736-1799). The stirring words of Patrick Henry, "Give me liberty, or give me death," furnish the keynote of that famous orator's public career. As an agitator and a champion of the common people he had no equal in his day.

Patrick Henry was born in east-central Virginia, of good Scottish stock, and received such education as the scanty opportunities of that vicinity permitted. But he was a venturesome and fun-loving youth, and gave up his studies at the age of 15 to enter business. Three times within the next seven years he failed—twice as storekeeper, and once as a farmer. Convinced that he had no ability in either of these fields, he next turned his attention to law. Here he found a congenial pursuit, for he was a born talker. After a few weeks of study, he was admitted to the bar. He succeeded immediately as a pleader before frontier juries, and his accounts show that during the first three years of practice he collected fees in 1,185 cases.

In 1763 Patrick Henry supported the people against the established church in a case known as the "Parson's Cause." During the trial of the case he declared in an impassioned speech that a king by vetoing salutary acts of a colonial legislature "degenerates into a tyrant and forfeits all right to his subjects' obedience." This declaration brought him the love of the colonists, and a seat in the Virginia House of Burgesses, just at the time of the passage of the Stamp Act in 1765.

When the older members of that House hesitated, not knowing what course to take in regard to the Stamp Act, Patrick Henry brought in a series of



HENRY IV

"Now glory to the Lord of Hosts, from whom all glories are!
And glory to our Sovereign Liege, King Henry of Navarre!"

resolutions, declaring that the English Parliament had no right to tax the American colonies. In the debate which followed, Henry exclaimed with terrifying boldness: "Caesar had his Brutus; Charles the First, his Cromwell; and George the Third" Here he was interrupted by loud cries of "Treason! Treason!" from members of the House. Pausing for a moment Henry coolly added: "And George the Third may profit by their example. If *this* be treason make the most of it!" This fiery speech secured the adoption of the resolutions. By his fearlessness and his eloquence Patrick Henry had become the spokesman for the colonial cause in the southern colonies, as James Otis and Samuel Adams were in New England.

In 1774 Henry was sent by Virginia as a member of the first Continental Congress, where he declared in ringing tones, "I am not a Virginian, but an *American*!" Next year at the second revolutionary "convention" called in Virginia, he made his most frequently quoted speech, in urging the colony to arm her militia:

"Gentlemen may cry peace! peace!" he said, "but there is no peace! The war is actually begun! The next gale that sweeps from the North will bring to our ears the clash of resounding arms! Our brethren are already in the field. Is life so dear, or peace so sweet as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take; but as for me, give me liberty, or give me death."

No one contributed more to arouse the people of Virginia, and a few months later Henry was appointed commander-in-chief of the Virginia troops. He soon quarreled, however, with the Committee of Public Safety, which acted as the governing body of the colony, and resigned his commission. This was perhaps fortunate, for Henry had greater talents as an agitator than as a military leader.

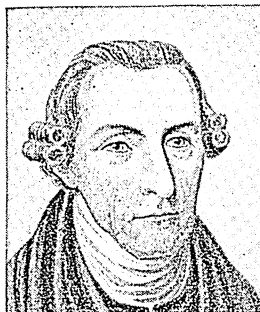
Patrick Henry also aided in drawing up Virginia's state constitution in 1776, and was elected first governor of the state. He filled this post moderately well and was three times reelected. It was with a commission from Governor Henry that George Rogers Clark set out to conquer the territory northwest of the Ohio from the British.

Henry Opposes the Constitution

In the Virginia convention of 1788, called to ratify the new constitution of the United States, Patrick Henry bitterly opposed the adoption of the new form of government, which he believed was dangerous to the liberties of the country. He objected to it because it contained no "bill of rights," because it infringed too much on the rights of the States, and because (as he said) it would prove "one great consolidated national government of the people of all the States," instead of a mere confederation. And he

asked, "Who authorized them (the framers) to speak the language, *we the people*, instead of, *we the States*?" Fortunately Henry's advice to reject the Constitution was overruled by the wiser counsels of Washington and Madison; but as a result of such opposition the first ten amendments to the Constitution were adopted, known as the "bill of rights."

Henry refused all offices under the new government. In 1799, however, he consented to serve again in the Virginia legislative assembly, but he died before he could take his seat. Long before that event he had become reconciled to the Federal Constitution whose adoption he had so bitterly opposed.



PATRICK HENRY
The Orator of the Revolution

HENRY THE NAVIGATOR (1394-1460).

"It is said, Sire," remonstrated the sailor, "that he who crosses the Sea of Darkness will be changed into a black—God's vengeance on his insolent prying; that he will reach the Devil's ocean that boils day and night with fiery heat; and that he will find its hellish coasts fringed with sea monsters, serpent rocks, water-unicorns, and other fearsome creatures!"

Prince Henry of Portugal, that munificent patron of voyagers and explorers and one of the heroes of modern discovery, laughed at his captain's fears. "The sea is as easy to sail in as the waters at home," he told him, "and the land very rich and pleasant. Heed not these idle tales; for, by God's help, fame and profit must come from your voyage, if you will but persevere."

Prince Henry did more than any other single person to make the 15th, 16th, and 17th centuries the great Age of Discovery. For 50 years he kept encouraging his countrymen to sail down the west coast of Africa, so that before his death they had pierced through into the unknown South for nearly 2,000 miles.

A Man of Amazing Energy

Henry the Navigator, as he is called in honor of the discoveries he inspired, was the fifth son of John I, king of Portugal, and of Philippa, daughter of the English John of Gaunt. He early distinguished himself at the conquest of Ceuta, the "African Gibraltar," in 1415. Soon afterwards he moved to Sagres, a town close to Cape St. Vincent, where he resided for a great part of his life. While warring against the Moors of Africa, he became greatly interested in this mighty continent, and longed for a better knowledge of the western ocean and the discovery of unknown regions. He founded an observatory and also a school where young men could learn navigation. Then he began sending out expeditions. One by one the rich islands of the Azores, Madeira, the Canaries, and Cape Verde were discovered, and the African coast was explored as far as Sierra Leone. "Explore, trade, convert!" said Prince Henry to his men. All this they did, and—less happily—began trading in captured African slaves.

Prince Henry died before the full results of his work were seen. These results, which made people at last realize that the oceans were not great lakes in a world of land, were credited to others. But the real master of the bold sailors who discovered America, rounded the Cape of Good Hope, reached India, and finally encircled the globe was Henry the Navigator.

HEPATICA. Sometimes while wandering among the woods and hills in early spring you come upon little clumps of delicately tinted flowers in fuzzy coats, which raise their lovely heads through the old dead forest leaves, like the dainty faces of a bevy of patrician ladies muffled in their furs. These are the hepaticas. What charm they have, these little blossoms of blue, lavender, pink, or white—no two clusters alike in shade or size! Even the gift of fragrance is not entirely denied them, but, in the language of John Burroughs, "seems as capricious as the gift of genius in families." Sheltered from the frost by their rusty evergreen leaves, and warmed by the late winter sunshine, they bloom even under the snow itself, on shaded hillside or in woodland dell. And then, after the blossoms, come the new green leaves—rounded, leathery, and glossy green, sometimes mottled with purple—to replace the last year's weather-worn foliage. There are many spring blossoms to follow, but none is fairer than this brave little wildling of the Crowfoot family that heralds the spring from Nova Scotia to Florida and westward to Manitoba, Iowa, and Missouri.

Scientific name, *Hepatica triloba*. The flowers, growing singly on slender stems, are about three-quarters of an inch broad and have 6 to 12 petal-like sepals enclosed in three fuzzy reddish-green leaflets. In the center are numerous pistils and anther-bearing stamens. There is no corolla, the sepals taking the place of ordinary petals. The slender, hairy stems, springing from the roots, are from 4 to 6 inches tall, and each bears a flower or leaf. The 3-lobed evergreen leaves are thick and liver-shaped, whence the name "hepatica" (from the Greek, meaning "liver").

HEPHAESTUS (*hē-fēs'tūs*). The lame god Hephaestus (Roman Vulcanus), the son of Zeus and Hera, was the god of fire and the forge. He was lame from birth, according to some stories; but others assert that he was crippled by being hurled down to earth by Zeus, falling on the island of Lemnos, where he built a palace, with a workshop and anvil. He also had a beautiful palace in Olympus, or, according to others, under Mount Aetna, on the island of Sicily. Here with the help of the Cyclops, the one-eyed giants, he made the thunderbolts of Zeus, the armor of Achilles, and the weapons of Hercules. He was also aided by handmaidens whom he had made of gold and endowed with life. All the palaces of Olympus were built by him. In the Homeric poems the kind hearted but limping god is represented as a comic figure whose deformity provokes "inextinguishable laughter" in the other gods. He was the patron deity of the metal-workers.

HERA (*hē'rá*). By the side of Zeus on Mount Olympus, as the Greeks believed, reigned his stately wife Hera (called by the Romans Juno), queen of the

gods. Their life was not always one of harmony, however, for Hera was quick to anger and Zeus frequently gave cause for jealousy. Hera was the goddess of womanhood, of marriage, and of maternity. The peacock, the cuckoo, and the pomegranate were sacred to her. She was usually represented as a beautiful majestic woman of mature age, with large wide-open eyes and grave expression inspiring reverence. Homer speaks of her as the "white-armed goddess" and the "ox-eyed queen." The most famous statue of Hera was the one by Polyclitus in the temple at Argos. This was a colossal image, in ivory and gold, representing the goddess seated on her throne, wearing a crown and bearing in one hand a pomegranate and in the other a scepter with a cuckoo at the top.

HERALDRY. In the Middle Ages, when knights wore armor that completely covered their heads and bodies, there grew up the custom of emblazoning devices on shields and surcoats so that the wearers could be distinguished. By slow degrees an elaborate science of heraldry developed. Strict rules were laid down regulating the assumption and design of armorial bearings, and colleges of heralds were founded to enforce observance of the rules. Most of the terms used in heraldry are French, because that language prevailed while the science was growing up.

Several coats of arms are often arranged or "marshalled" on the same shield or "escutcheon" to show descent, marriage, alliance, etc. To enable this to be done the shield is divided into halves by a single line extending across it vertically, diagonally, or horizontally; or it is divided into "quarters" by a cross-shaped arrangement of lines, and these quarters may be further subdivided. The colors or "tinctures" are called *or* (gold), *argent* (silver), *gules* (red), *azure* (blue), *sable* (black), *vert* (green), and *purpure* (purple).

The "charges" or devices are of infinite variety. Some are wide bands, variously named according to the direction in which they cross the shield. Thus the "pale" extends from top to bottom, the "fess" is a horizontal band in the middle, and the "bend" crosses diagonally from the upper left-hand corner (*dexter chief*) to the lower right-hand corner (*sinister base*). The "bend sinister," crossing from upper right to lower left, is popularly but erroneously considered a mark of illegitimacy. Other common charges are simple geometrical designs, and others are conventionalized representations of animals, flowers, trees, leaves, etc. The animal most frequently used is the lion, which may have several positions: *rampant* (erect on the hind legs), *passant* (walking), *couchant* (lying with the head raised), *dormant* (asleep), etc.

Heraldry gets its name from the heralds of the Middle Ages, who were the official representatives of kings and lords. The heralds were also the court chroniclers, and it was their duty to keep track of family relationships and of the intricate etiquette governing coats-of-arms.

Some ADVENTURES of the Great HERCULES

The Many Valiant Exploits of the Mightiest of Greek Heroes—How He Chose Virtue for His Guide, and Performed Deeds of Superhuman Daring

HERCULES (*hēr'kiu-lēz*). The most celebrated of all the Greek heroes was the mighty and great-hearted Hercules (or Heracles as the Greeks called him), the son of the great god Zeus and the mortal Alcmena. The goddess Hera (Juno) was hostile to Hercules from his birth, and sent two serpents to destroy him in his cradle, but the infant strangled them with his hands. He was trained in manly accomplishments by the famous centaur Chiron and other heroes of renown.

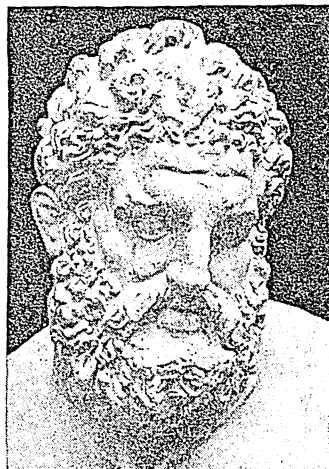
When Hercules reached young manhood, so the story goes, two beautiful maidens appeared to him, Arete (virtue) and Kakia (vice). Kakia offered him a life of ease, pleasure, and riches, if he would follow her; Arete said that if he chose her, he must live a life of poverty and hardship, and spend his days in continual struggle against evil. Hercules chose to be guided by Arete in the hard path she pointed out to him.

In a fit of frenzy sent by Hera he slew his own children, and to atone he was forced to serve his cousin King Eurystheus, who compelled him to perform the great tasks known as the "twelve labors."

The first labor was the slaying of the Nemean lion, a monstrous beast that terrified the country of Nemea. Hercules strangled the animal with his own hands; and ever afterwards wore the lion's skin. Next he slew the Hydra, a terrible nine-headed water serpent. As soon as he crushed one of the monster's heads with his club, two more grew in its place, but finally with the help of a friend, who seared each neck with a blazing branch, Hercules succeeded in killing the Hydra. He then dipped his arrows in the poison of the serpent.

His third task was to capture and bring alive to Eurystheus the Cerynean stag, an animal with golden horns and brazen hoofs, so fleet of foot that it scarcely touched the ground. The capture of the wild Erymanthian boar was the fourth labor. A greater task was the fifth, the cleansing of the Augean stables. Augeas, king of Elis, had a herd of 3,000 oxen, whose stalls had not been cleansed for 30 years. By turning the rivers Alpheus and Peneus through the stables, Hercules finished the work in a single day.

As the sixth and seventh labors, he killed with his poisoned arrows the Stymphalian birds, which fed on human flesh, and captured the Cretan bull. This bull had been sent by Poseidon (Neptune) for Minos, king of Crete, to sacrifice. But Minos was so pleased



A familiar portrayal of Hercules is this majestic head, from a statue in the British Museum, London.

with the beauty of the animal that he kept it for his own; whereupon Poseidon drove the bull mad and it caused great damage. Next came the capture of the horses of Diomedes, the Thracian king. These were wild mares to whom Diomedes fed the flesh of all strangers. Hercules killed Diomedes and threw his body to the horses, before bringing them to Eurystheus.

Hercules was then dispatched to obtain the beautiful girdle of Hippolyta, queen of the Amazons. Single-handed, the hero defeated the warrior-women, killed the queen, and escaped with the girdle. The tenth labor was the capture of the oxen of Geryon, a monster with three bodies, who dwelt on the fabulous island of

Erythia, beyond the straits of Gibraltar. On his journey the hero erected the famous rocks on either side of the strait, known as the "Pillars of Hercules."

The eleventh exploit was to obtain the golden apples of the Hesperides, which Gaea, or Mother Earth, had presented to the goddess Hera as a wedding gift. Hercules succeeded through the help of the Titan Atlas, father of the Hesperides, the four sister-nymphs who guarded the apples with the help of a sleepless dragon. Atlas, whose task it was to support the weight of the heavens on his shoulders, went to get the apples, while Hercules relieved him of his burden. While engaged in this labor, the hero encountered some other strange adventures, for on the way he met the tiny race of men called Pygmies and slew the giant Antaeus, son of Poseidon and Gaea, who compelled all strangers coming into his country to wrestle with him, on condition that if he conquered they would suffer death.

The last labor was bringing Cerberus up from the lower world. Braving the dread regions of Hades, he captured this many-headed dog, who guarded the entrance, and brought him before Eurystheus, who was so terrified that Hercules had to take back the monster to the realm of the dead.

Having finished his appointed tasks, Hercules was now freed from bondage. But these were not the only feats of strength and valor he performed. He gave way to violence at times, and once, in a fit of rage, slew his friend Iphitus, but for the most part his strength was used to relieve those who suffered pain or oppression. He delivered Prometheus, who for ages had been chained to Mount Caucasus. He brought back from the grave the noble Alcestis, who had given her life for her husband.

As the life of Hercules was a hard one, so also was the manner of his death. With his wife Dejanira he came to the bank of a river across which travelers were carried by the centaur Nessus. Hercules waded across the stream, while Nessus carried Dejanira. But when the centaur attempted to run away with Dejanira, Hercules shot him with one of the poisoned arrows. The dying Nessus called to Dejanira to take some of his blood and keep it as a charm to preserve the love of her husband. Before long, Dejanira, hearing that Hercules was in love with another maiden, sent him a robe which she had steeped in the blood of Nessus. No sooner had he put on the robe

than poison spread through his body like fire and caused him such agony that fleeing to Mount Oeta he built a funeral pyre on which he threw himself to die. But as the flames consumed his body, Zeus caught up the immortal part and bore it to Mount Olympus, where, purged of mortal sin and sorrow, Hercules dwelt among the gods in eternal happiness.

Hercules has been a favorite character in literature and his heroic strength has inspired many beautiful works of art. The finest representation of the hero in sculpture is the so-called Farnese Hercules, now in the Naples Museum. This is a copy of an earlier work by the ancient sculptor Lysippus.

LIFE'S LAWS of INHERITANCE, from PLANTS to MAN

The Amazing Laws Discovered by an Austrian Monk, and How They Work—The Mysterious Chromatin that Carries All Heredity, One Ounce Enough for Millions of Offspring—How "Environment" Modifies Heredity

HEREDITY. The saying, "Like begets like,"—each kind of living thing "after its own kind"—expresses essentially the general fact of heredity, the universal law among all kinds of living things, both animals and plants. That it is so is a matter of observation in thousands of times and places, by anyone with sharp eyes, keen wits, and a mind open to the amazing things found in all of the common forms of life. An acorn grows into the giant oak, and not into the peach tree; and a hen's egg hatches into a chick with its many peculiarities, and not into a duckling.

But it is the outside or superficial things that most of us see, and we are apt to forget the vast multitude of more deep-seated resemblances between parent and offspring, many of them on the inside of an animal like man. The parents are tall, have dark hair, and dark eyes; the child will likely be tall, have dark hair, and dark eyes. But think a moment of the deeper things. The parents have three-jointed fingers and toes, eyelids, valves in the heart, many muscles and bones in nice order, many nerves always supplying the same parts of the body—and a thousand and one other things. So the child gets all these in proper form from his parents—always a miracle, and almost always unthought of! It is only when the child is not quite normal that people are apt to think of the unusual thing, when all the while the usual thing is the really more wonderful. How amazingly delicate and minute inheritance is may be observed by anyone among almost any kind of pure-bred domestic animals or plants, or almost any kind of animals or plants in Nature. And yet it remains true that we should really say that "like begets almost like"; for the likeness of parent to offspring is never complete.

The resemblance of child to parents is not limited to the structures of the body. The parent is keen, aggressive, resourceful, has a good memory—a thousand and one other things that make for "personality."

So the child gets an amazing lot of things from its parentage. In many cases, of course, it is matter of common observation that the resemblance has come from the grandparents, or even more remote ancestors. In such cases, naturally, the traits have lain dormant in one or more generations. Francis Galton, the great English student of many human phenomena, stated this fact in the general law that children resemble their parents about half; grandparents about a quarter; great-grandparents about an eighth, etc. In recent years the tendency has been to place the proportion derived from the parents at a somewhat higher figure.

We can start looking into the whys and wherefores of heredity with something we all know—a hen's egg. As formed in the hen, the egg is a single cell, containing a bit of living protoplasm with a nucleus (*see Cell*), yellow food matter called *yolk*, and a layer of white albuminous matter, within a protecting shell. Such an egg is *unfertile*, and will not hatch.

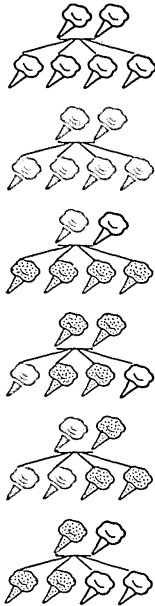
But suppose a germ cell contributed by the male parent finds its way inside the mother's body to the egg before the shell is formed, and fuses with the nucleus, as shown in the picture on page 285. Now the egg is *fertile*. The cells from each parent, fused into one, will divide and redivide until they have formed a living chick, by the process called *mitosis*. (For picture, *see Biology*.)

Mitosis is controlled in every cell by threads of matter called *chromatin*, within the cell nucleus. Before division occurs, the chromatin forms itself into rods, called *chromosomes*. The number formed depends upon the species of living being; and within every cell in any individual of a species, the number is always the same. Then the chromosomes split lengthwise, and one-half goes to each of the new cells.

In this simple type of division, the two new cells always resemble the old one. Such divisions replace all cells in ordinary, or *somatic*, tissues, and supply additional cells for growth. But the fertilized cell

Mendel's Law and Its Explanation I

Case 1 Four o'Clocks



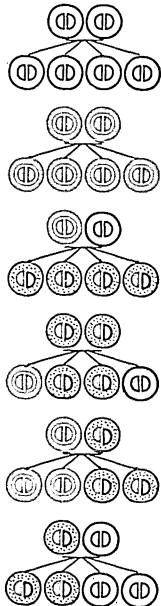
Two white parents have four white children,
two red parents have four red children,
but two pink parents do not have four pink children - why?
Explanation: the carriers of color heredity are composed of
color elements, in this case of red and white.

Combinations of
heredity elements

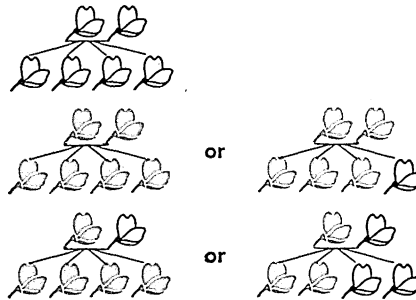
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plus appearance

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Case 2 Peas



Here no intermediate color, like pink, appears

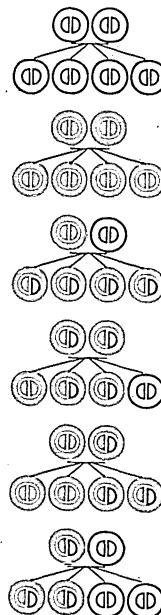
Mendel says we must know the color of the grandparents
to know what colors will appear in the grandchildren.
The combination of the heredity elements
red + red appears red,
the combination of the heredity elements
red + white also appears red. He says red is »dominant«.

Combinations of
heredity elements

⊖ ⊖
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plus appearance

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THE DIAGRAMS on these two pages show how Mendel's Law of Heredity works out in the inheritance of color for two types of flowers.

CASE 1—THE FOUR O'CLOCKS

In the upper left-hand corner of the opposite page we see six family groups of the flowers called four o'clocks. Each group consists of two parents and four children, and the six groups show every possible combination of white, red, and pink parents, together with the colors we may expect to find in each case among the children.

The results in the first three groups will seem obvious. White parents have white children. Red parents have red children. The cross between a red parent and a white parent produces pink children.

But notice what happens in the fourth group where both parents are pink. Instead of four pink children we see one red, two pink, and one white.

To understand this result we must turn to the diagrams below. These represent the same family groups. But here we are shown the color-producing elements of each flower. These are shown in pairs, because each parent contributes an element. We notice that there is no pink element—that pink is merely the appearance produced by the combination of a red element with a white one.

Now we can figure out the reasons for the different colors among the children of the fourth group. If a child happens to draw a red element from each parent, the child will be red. If it draws a white element from each, it will be white. But it has a double chance to draw a red-and-white combination, since it may get either a red from the first parent and a white from the second, or a white from the first and a red from the second. That is why biologists say that *the offspring of hybrids inherit contrasting traits from their parents in the ratio 1 : 2 : 1*.

With the help of the diagram we can similarly see the reason for the colors in the children of the fourth and fifth family groups, where the possible combinations are red-red with red-white, and red-white with white-white.

CASE 2—THE PEA FLOWERS

Here we see at once that there is a difference between peas and four o'clocks in color inheritance. The difference is due to the fact that there are two kinds of red pea blossoms. There is the pure red derived from two red parents; and there is the hybrid red from a red-and-white cross which, instead of being pink, looks exactly like a pure red blossom.

That is why the pictures of the family groups at the top show two possible results from breeding red with red or red with white. In each case the outcome depends on whether the red is pure or hybrid.

The diagrams at the bottom show that the heredity elements for the peas are exactly the same as for the four o'clocks. And in these diagrams the pure reds (two red elements) are easily distinguished from the hybrids (red and white elements). But examination of the blossoms themselves will not show the difference. The only way to find out whether a red pea flower is a pure red or a hybrid is to cross it with a white flower. As the third diagram shows, if it is pure red, the result of the cross will be all red children. The sixth diagram shows that, if it is a hybrid, half the children will be white.

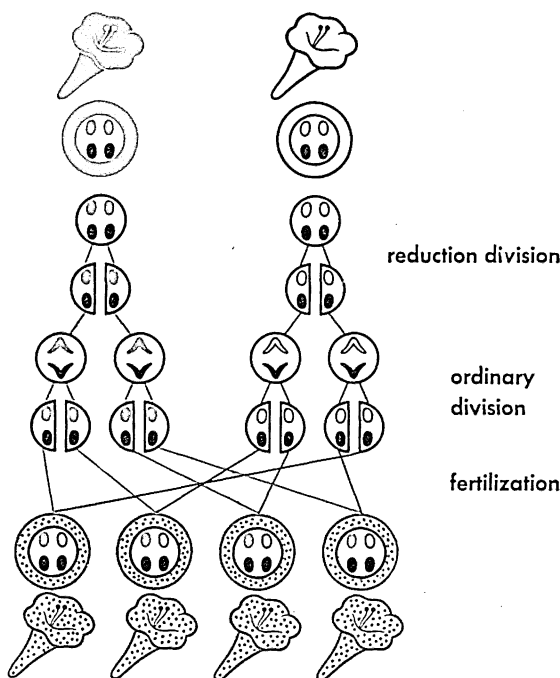
DOMINANT AND RECESSIVE

When one trait of a plant or animal conceals another, as the red conceals the white in pea blossoms, that color is said to be *dominant*. The trait whose presence in the mixture is concealed, like the white of the pea-blossoms, is said to be *recessive*. The dominant-recessive type of inheritance is more common than the type illustrated by the four o'clocks.

Mendel's Law and Its Explanation II

Later on scientists showed that Mendel's Law depends on microscopic bodies called **chromosomes**

How Chromosomes Carry Heredity



WE HAVE seen on the opposite page the end results of Mendel's Law of Heredity in many different family groups. Here we single out one of those families to show how the elements of color heredity are actually transmitted from the two parents to the children. The family selected is the third group of four o'clocks, consisting of a red parent, a white parent, and four pink children.

Under each parent blossom we see a germ cell. Inside the cells are pairs of dots representing the *chromosomes*. The red pair and the white pair contain the color-carrying elements. The black pairs represent other characteristics that are inherited. We can disregard the black ones except to observe that they behave like the others.

Notice that the original cells now split apart, dividing each pair of chromosomes (reduction division). The new cells produced in this way have half as many chromosomes as ordinary cells. They are called *gametes*.

The chromosomes in each gamete now change shape, and as the gametes themselves undergo division, each chromosome splits, and half of each goes into a new and mature gamete.

Now fertilization takes place. To make this clearer, let us assume that the gametes containing the red elements are the males (*spermatozoa* or *sperm cells*) and the gametes with the white elements are the females (*ova* or *egg cells*). Then we see that each sperm cell fertilizes an egg cell and thus joins with it in forming a new complete cell (*zygote*) from which a new plant will develop.

Each of these new cells contains a red element from the male side and a white element from the female side. As each of them divides and redivides again and again in producing the growth of the new plant, the color elements also divide equally, so that every cell thereafter also contains a red and a white color element.

formed by the union of two parent cells must divide and redivide in such a way as to produce all the tissues needed by the new living body. Also, this fertilized cell is formed by the *union* of two parent cells; so if each parent cell had the usual amount of chromatin, the fertilized cell would have too much.

Germ cells therefore undergo more complicated changes than somatic cells, but science has managed to discover much of what happens. The chromatin in germ cells is adjusted to the right amount when the cells form. A special type of "reduction" division gives each germ cell, father and mother, only half the usual number of chromosomes. Such a specialized germ cell is called a *gamete* and its nucleus is called a *pronucleus*. Union of gametes gives the fertilized cell the right number of chromosomes.

Heredity-Carrying "Genes"

In recent years students of heredity, especially T. H. Morgan, have discovered much about how germ cells carry heredity. They have learned that heredity is carried by particles called *genes*, contained like beads on a string, in the chromosomes. Each gene is believed to exercise some chemical or other influence on one or more bodily processes; in some cases, several coöperate to direct a process, such as coloring an eye. Since chromosomes may come from either parent, and each may contain thousands of genes, there are genes enough to explain heredity.

Even more wonderful is the explanation of inheritance from grandparents and remote ancestors. In every new living body, some of the earliest divisions made by the fertilized germ cell result in material being set aside to form germ cells for that body when its time comes to reproduce. Thus the heritage of genes, often called "continuity of germ plasm," which shapes physical life, passes on unbroken from generation to generation. Germ cells can be immortal, so long as they are passed on to new individuals. Every living being contains an unbroken inheritance from its very first ancestors.

Usually genes from each parent join "pair and pair alike" along each chromosome. When chromosomes "exchange" portions of their length before joining, they have "crossed over," and the heritage given the new living being is affected.

The discovery of genes has merely given a clue to the secret of heredity—but the clue is a fruitful one. The first discoveries were made by studying fruit flies, which breed rapidly and thus reveal quickly the result of any change detected in genes. Scientists now treat genes with X-rays, chemicals, and other influences, and can detect resulting changes in the flies. Such methods are enlarging our knowledge of heredity rapidly.

Some Laws of Heredity

Before genes were discovered, men had learned how heredity works out in many cases, without knowing why. The outstanding worker in studying heredity was an Austrian monk, Gregor Mendel (1822-1884), who published his discoveries in 1866, although the im-

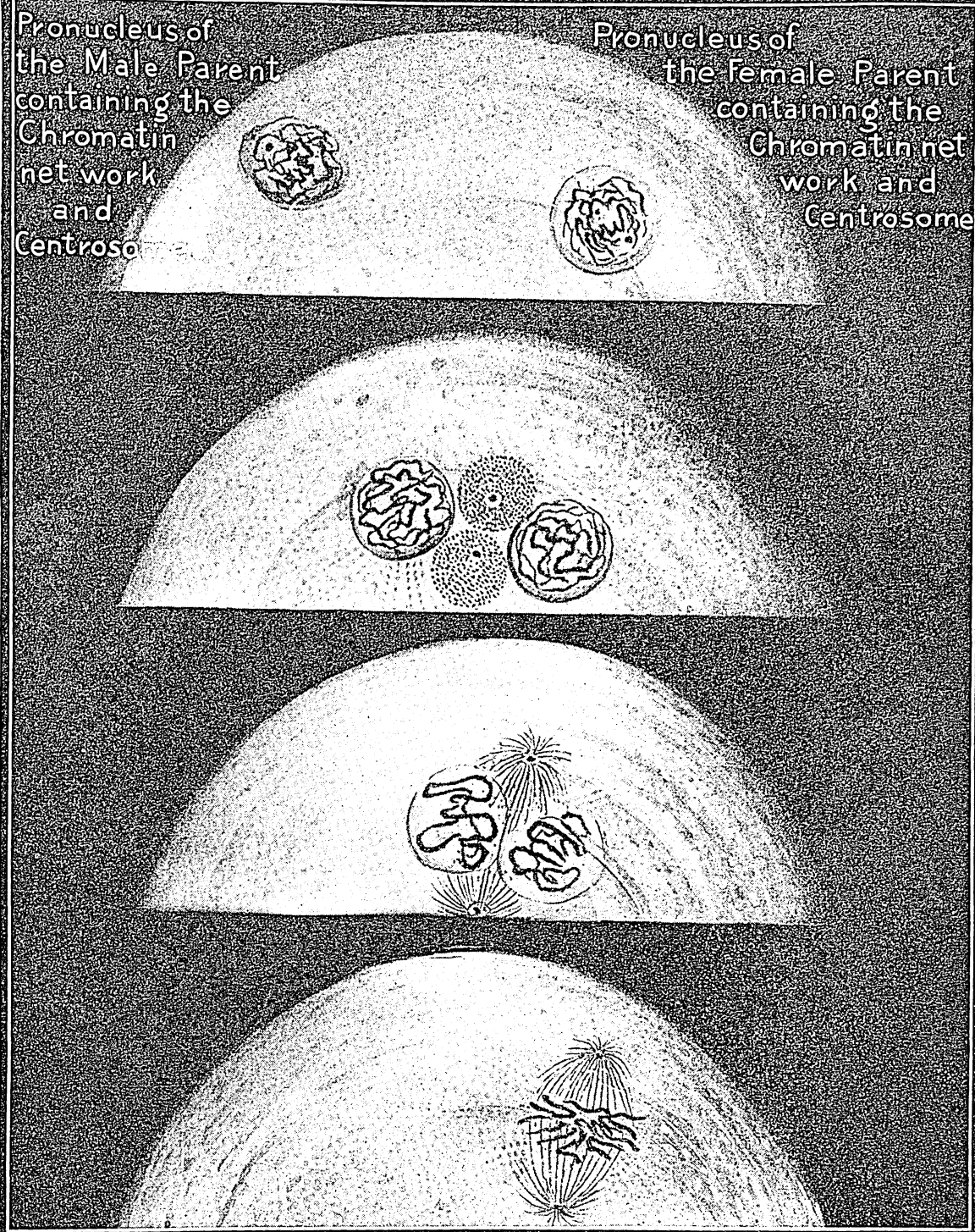
portance of his work was not recognized till 1900. He worked especially with peas, and the amazing thing is that his laws have been found to apply to many things, in many kinds of animals and plants. Think of it, the same *laws* for inheritance of many things in an animal, such as a guinea-pig, as for a plant like a pea! Let us illustrate by guinea-pigs. If the two parents be from pure strains, *black* and *white*, the children will be, not *gray* as might be expected, but *all black* in the first generation—all *apparently* pure black! But in the next generation about one-fourth of the children come out pure *white* again, one-fourth pure *black*, and a half *apparently* pure black, but really *mixed* again. The pure whites and blacks will breed true, but the mixed ones will yield children of which a quarter are pure white, another quarter pure black, and half mixed. And so on, indefinitely. You see, in the apparently black there is hidden the white, to come out pure again in a quarter of the children of the next generation. In this case, where the black temporarily hides the white, the black is said to be "dominant" over the white. In some cases—"four-o'clocks" among plants, for instance—the children will be half-way between the two parents, and crosses of *reds* and *whites* will yield *pink* flowers in the first generation. But in the next there emerge a quarter pure red, another quarter pure white, and half pink. The whites are pure, so are the reds; but the pinks are mixed, and will behave exactly as in the color of the guinea-pigs—except that one color is not "dominant" in this case.

Only a very few of the many illustrations of Mendel's law can be cited, and it must be remembered all the while that it is a matter of experiment in all cases to find out whether for any feature of any animal or plant it will follow Mendel's law. The following are among the most interesting: In rabbits and guinea-pigs, black is dominant over white, and short hair is dominant over long hair. Among cattle, hornless character of the "muley" is dominant over horned, short legs over long legs. In horses, bay is dominant over black or chestnut, and gray over all other colors, and pacing over trotting. In pigs, pure white is dominant over color, and black over red. In dogs, gray is dominant over black, and any pure color over mixed colors, like black-and-tan. These are but a few of the illustrations for a few animals; hundreds of others might be cited. It should be said, too, that some of the laws that have been discovered are much too intricate to give here. But enough is known to show that much advantage may be derived in future by applying the *laws of heredity* in improving many of man's domestic animals and plants.

Mendel's Law Applied to Man

What do we know of the laws of heredity as applied to *man*? Things we inherit fall under several types, and the following is the classification given by Professor Castle. In matters of stature, size of body, skin-color, shape of head and its features, children are apt to be intermediate between father and

HOW THE OLD LIFE PASSES INTO THE NEW



This picture represents the astonishing process by which the first complete cell of a new plant or animal life is produced. At the top we see a segment of the egg, with the female "pronucleus" at the right. The male "pronucleus" at the left has just made its way into the egg and is approaching the female. Notice the black dot in each "pronucleus"—those are the energy centers called "centrosomes." In the next section, the male and the female "pronuclei" have drawn close together and the two "centrosomes" have come out and arranged themselves in the space between the pronuclei. In the third section, the "centrosomes" have developed radiating threads, forcing the nuclei together. Finally, at the bottom, the male and female elements have merged into one group. At this instant a new life begins. The chromatin from each "pronucleus" has arranged itself into a central mass, which is composed of exactly equal parts of male and female substance. The new cell will now begin to grow as a separate life unit, inheriting its vital germs from both father and mother cells. How this new cell now proceeds to split up and form other new cells is explained in the picture entitled 'The Most Wonderful of All Life's Processes' accompanying the article on Biology.

mother. The following illustrate Mendel's law: Dark eyes dominate over light eyes; two-jointed fingers over normal three-jointed; brittle bones (of some people) over normal bones; normal eyes over color-blindness and over night-blindness; normal minds over feeble-minded. And so for other things. But it should be said that most human characteristics have not yet been shown to follow Mendel's law. Certain physical qualities are definitely known to be hereditary. Among these, in addition to the traits mentioned above, are left-handedness, hemophilia (tendency to bleed), baldness, and cataract of the eye. Many other characteristics seem to have a hereditary basis, but to what extent and how they are inherited is not known. Examples of such traits are general mental ability, certain forms of insanity, longevity, and tendency to bear twins. Many people have the false idea that diseases are inherited. It is true that a *tendency* to some diseases may run in a family, just as in other families there is a natural immunity from some diseases. But a disease itself is not inherited. Tuberculosis is a disease due to tubercle germs. A child may be born with a constitutional tendency to the disease, but the germs come in after birth, with the food, water, or air.

The relative importance of heredity and environment in a human life is a question as old as the ages—a question never possible of a very accurate solution. Of course, it is clear to anyone that life is a very intricate fabric, in which the "warp" is supplied by heredity, and the "woof" by the things that come into one's life, mostly after birth. All these things that come in after birth make up what is usually called the "environment"—the food we eat, the air we breathe, the water we drink; still more important, the surroundings that make for moral and mental and spiritual welfare or disaster—the millions of things that come into all lives—these all together make up the "environment." And what of the relative importance of the multitude of things we bring into the world, and the infinitude of things the world gives us—even thrusts upon us?

How Much Do We Owe to Heredity?

On the one hand are those who maintain that a person is so strongly stamped by heredity—the things he brings into the world with him—that whatever he is and does in life is almost wholly the result of his inheritance. On the other side are those who maintain that the child at birth is so plastic that there are practically no limitations upon the possibilities; that, with proper surroundings and education, all for good is possible; with untoward surroundings, all for bad.

The truth certainly lies somewhere between the two extremes. Certainly the main qualities are stamped by heredity—stature, "stamina," tendency to good health, general ability, temperament—or the reverse of all these. But the outlet for any personality is most certainly dependent on its surroundings; and what a person becomes will much depend on his place and mode of life, his education, friends all of

the infinitude of things that make up his "environment." Just as there are sandy, sterile soils, and very fertile soils, and all grades between, so there are defective minds (the feeble-minded) and geniuses, and all grades between. And just as there are sterile soils for which cultivation will do nothing, while it will help much the other soils, so there are the helpless minds, for whom education and other forms of help avail little or nothing; while they avail much for the average mind, and most of all for the superior mind.

The weak person is always weak, whatever the surroundings; the person of average native ability and personality will be very much what his surroundings make him; while the strong person will be strong in any place or station in life. The particular form which his strength will take will depend on time and place. George Washington would have been great in any place and time, but he would not have been the "Father of his Country" had there been no Revolutionary War. Thomas Edison would have been strong anywhere and in any place; he became a great inventor because he lived in America at a time when the world of science and industry about him made his discoveries possible. So we may conclude that the person of average native ability will still be average in almost any time and place, while a great career is a combination of great native ability, character, and personality, with great opportunity.

HERMES. "A schemer subtle beyond all belief" was the Greek god Hermes, also called Mercurius (Mercury) by the Romans. He was the son of Zeus and Maia, daughter of Atlas. He began his career by escaping from his cradle, when a few hours old, and going out in search of adventures. Finding a tortoise, he took the shell and stretched cords across it, thus inventing the lyre. That same evening he stole the oxen of Apollo, god of the sun, hid them in a cave, and killed two of the oxen. When Apollo discovered the theft, Hermes so charmed him by playing on the lyre that he allowed the little rogue to go unpunished. Hermes gave his lyre to Apollo and received in return a magic wand, called the *caduceus*, which bestowed wealth and prosperity and turned everything it touched into gold.

Hermes was made the messenger of the gods, and in this capacity one of his many duties was to conduct the shades of the dead to the lower world. Among men he became the patron of merchants, the god of eloquence, of good fortune, of prudence and cunning, of fraud and theft. He was also regarded as the god of the roads and the protector of travelers. Pillars with his image at the top were erected as guideposts.

Hermes was represented most commonly as a slender youth, wearing a broad-brimmed hat adorned with two small wings, and carrying the caduceus in his hand. On his sandals were wings that bore him over land and sea with the swiftness of the wind. Of the statues that have come down to us from antiquity, the most famous is that by Praxiteles, representing Hermes carrying the infant Dionysus.

HERO AND LEANDER. The imperishable story of Hero, priestess of Aphrodite, and Leander, the stalwart lover who nightly swam the Hellespont to meet her, stands in literature as one of the supreme examples of ill-fated love. According to the story as told by various Greek and Roman poets (notably Musaeus in the 5th or 6th century A.D.) Hero used to place a lamp at the top of her lonely tower at Sestos each night to guide her lover in his struggle with the waves from Abydos on the other side of the strait. Venturing to make the passage one stormy night, he was drowned, and his body was washed up to the tower. Seeing the lifeless form of her lover, Hero plunged into the water that she might join him in death. The English poet Byron, who himself accomplished the difficult feat of swimming the Hellespont, refers to the tale in those well-known lines:

The winds are high on Helle's wave,
As on that night of stormy water
When Love, who sent, forgot to save
The young, the beautiful, the brave,
The lonely hope of Sestos' daughter.

HEROD. The family name of several rulers in Palestine, of whom Herod the Great, king of Judaea from 37 B.C. to 4 B.C., was the most conspicuous. Scholars in general hold that Jesus of Nazareth was born towards the end of this reign. Herod Antipas, son of Herod the Great and tetrarch (tributary prince) of Galilee from 4 B.C. to 39 A.D., is the Herod most frequently mentioned in the New Testament; it was to him that Jesus was sent by Pontius Pilate.

Herodias, the granddaughter of Herod the Great and wife of Herod Antipas, instigated her daughter Salome (by her first husband) to ask of Antipas, whom she charmed by her dancing, the head of John the Baptist on a charger (a large flat plate), and this was granted her. John had angered Herodias by denouncing Herod Antipas for casting aside his first wife for her. Several operas have been based on this story, which is also a favorite subject in painting.

HERODOTUS (about 484-425 B.C.). The Father of History, as Herodotus is called, was born at Halicarnassus, a Greek colony on the shores of Asia Minor. He early devoted himself to a literary life and traveled extensively, visiting the shores of the Hellespont and the Black Sea (Euxine), as well as Scythia, Syria, Palestine, Babylon, Egypt, and the northern part of Africa. He investigated both the customs and religion of the peoples and the history of the countries through which he passed. He made use of the material which he gathered in his great work—the first specifically historical work ever written. The special purpose of Herodotus' work, which consists of nine books, is to give an account of the conflict between the Greeks and the Persians, whose history and enmity Herodotus traces back to mythical times. Incidentally it is a treasure-store for the early history of all the lands about the Eastern Mediterranean. Much of this early history, as narrated by Herodotus in his fascinating volumes, has been modified by the excavations and other researches

of recent times; but considering the difficulties under which Herodotus collected his information, he is amazingly accurate.

HERONS. A family of long-legged wading birds, which includes also the bitterns and the night-herons. There are about 100 species, of which 12 occur in North America. They range in size from the great blue heron, four feet high, to the little green heron, the most familiar species in the United States, which measures 18 inches. Among them is the lovely egret, whose long white plumes have brought it such a tragic fate. (See Storks, Herons, and Cranes.)

HERRING. Economically the herring is the most important of all the families of fishes, for in addition to the typical fish of the family, the herring proper, it includes the shad, alewife, sardine and other food fishes, and also the menhaden. The menhaden is a very oily fish found in great schools off the east coast of the United States and taken chiefly for bait, manure, and for its oil.

The common herring is of immense value as a food fish, being used extensively both fresh and smoked or salted. A favorite preparation is the partly smoked form of "bloaters." Great quantities of young herring are canned and sold as sardines. Herring are found in incredible numbers in the North Sea, the north Atlantic, and the seas north of Asia. They swim in closely packed schools often covering areas of from 6 to 20 square miles. In the United States the chief fisheries are off the coast of Maine. A species similar to the common herring is found on the Pacific coast of America. The true herring belongs to the genus *Clupea*.

HESSIAN FLY. Tiny though it is—about one-eighth of an inch long—this insect pest does more damage to the grain field than any other. Its larvae or young suck the sap out of the tender shoots of wheat, rye, and barley. The damage to wheat alone has reached at least \$100,000,000 in one year in the United States. There have been many widespread invasions, and local outbreaks of the pest occur nearly every year. The average annual damage amounts to many millions of dollars.

The Hessian fly has long legs, long feathery antennae, or feelers, and oval, rather small gauzy wings. It belongs in the same family with the gall-gnats, wheat midges, etc. The eggs are laid in the sheaths of the leaves of the young plant, and the little flattened pale red maggots eat into a joint near the base of the stem just where the leaf fits onto the stalk. Before they grow into adult flies they pass through the pupal stage, in which they resemble, and are called, flax-seeds. The female lays from 100 to 150 eggs, which hatch in about five days. No remedy for this pest is known. Preventive measures include late sowing, after the insects have died; crop rotation; and plowing under of all infested stubble.

The fly gets its name from the common belief that it was brought into America by the Hessian troops during the War of the Revolution. Scientific name, *Cecidomyia destructor*.

SLEEP *that* LASTS ALL WINTER LONG

While the Grip of Ice and Snow is on the Land, Many Animals Withdraw to Shelters beyond the Reach of Frost and Remain in Deathlike Slumber until Warm Weather Returns—How They Live on Their Stored-up Fat

HIBERNATION. In northern countries the great majority of insects, worms, etc., and of the marine life fixed between high and low tide range, die in winter, leaving larvae to revive their race in the succeeding spring. Fishes of brooks and shallow streams, and of the shallows near shore, retire to deeper water. Most birds flee southward to a milder climate. This leaves a large body of terrestrial animals of various classes which, so far as passing the winter is concerned, may be divided roughly into two classes—those able to obtain food during the snowy season, and those whose food supply is cut off by wintry conditions.

For these latter the only alternative to death is hibernation—sleep in a sheltered place; and it is resorted to by all kinds of northern animals except birds and fishes. Earthworms burrow below the reach of frost. All manner of insects in their pupa stages lie inert within cocoons or earthen caskets. Frogs bury themselves deeply in the mud of the pond or in loose soil and rotting stumps. Serpents coil up in crevices of rocks or holes in the ground. And certain four-footed animals occupy deep burrows or warm nests, where many of them pass from the pseudo-death of sleep to the reality, and find their *hibernaculum* (sleeping-place) a grave.

In almost all cases of hibernation the animal is one that is unable to get its accustomed food in winter, and has not learned to gather and save under cover a store of imperishable sustenance, such as nuts, seeds, dried fungi, and the like. Yet even the true hibernators prepare unconsciously for the ordeal by accumulating much fat, eating amply in the abundance of autumn, when nature's bounty is greatest, and storing up in their bodies the fuel and

LITTLE DORMOUSE'S LONG REST



Just before it is time to "turn in" for the winter, the Dormice get as fat as butter. Then they curl up in winter beds, and spend most of their time dozing until spring.

sustenance that shall gradually be absorbed for the nourishment of their systems during the long weeks of their dormancy.

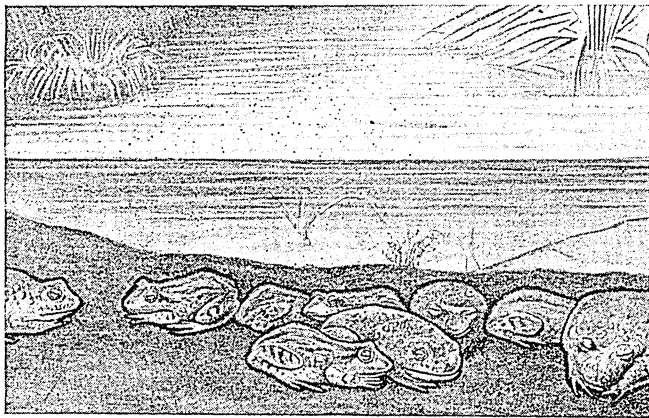
What is the nature of this dormancy? We do not know. It seems not to be different from ordinary slumber except in its depth and prolonged duration, and hibernating animals differ much in the soundness of their sleep. Some, such as our bats, the chipmunk, and the red squirrel, are light sleepers, and often on mild days will wake up, come out, and move about indolently until the

return of cold sends them back to bed. Bears are popularly regarded as special examples of hibernation, but they are among the most irregular. In very cold and snowy countries the females "den up" early and may be snowed under for weeks. They do not go into torpidity, but simply lie quietly, subsisting on their accumulated fat, the slow assimilation of which sustains their own life, and enables them to

nurse the babies which are born during this winter retirement. It is thus the female ice bear passes the cold months, but the males are abroad during all the long, dark, polar night, even as far north as men have ever gone. In the case of other northern species the males also hibernate, each by itself, but are liable to come out from time to time.

From the central United States southward the bear need not hibernate at all. This is true of several other animals which must sink into a state of dormant vitality in sub-arctic regions, or on high mountain tops. Another irregularity, exceptional in relation to the food supply, is shown in the woodchuck, which retires to its snug underground bedroom much before the ordinary time of severe frost and snow, and while plenty of green herbage

UNDER THE WINTER BEDCLOTHES

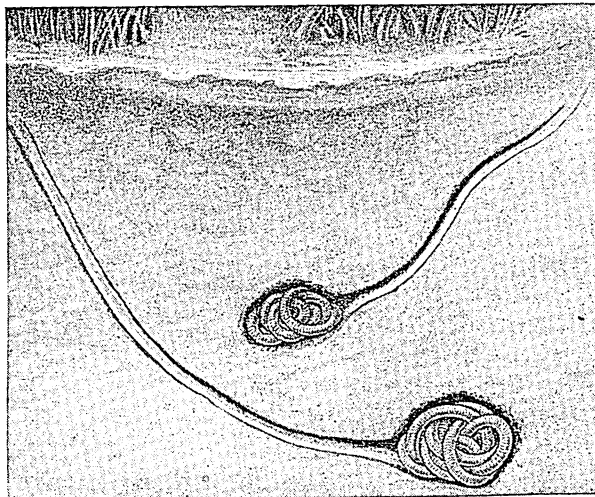


Frogs cover themselves with mud in the winter, using it for bedclothes during their long sleep.

remains for its nibbling. This may be due to a habit inherited from former conditions, when winter came earlier and ended earlier, for the woodchuck often comes out in spring long before he should. An even more striking example is the great European bat, which begins its retirement in July, when insects are still plentiful.

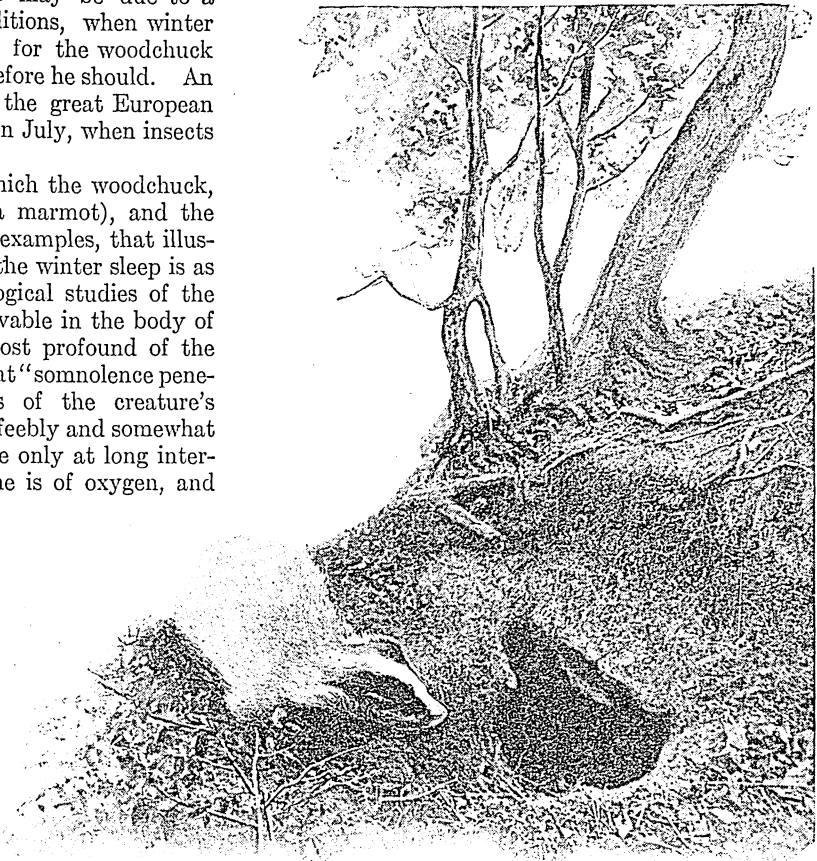
It is the heavy sleepers, of which the woodchuck, the Rocky Mountain siffleur (a marmot), and the jumping mice (*Zapus*) are good examples, that illustrate the condition best. Here the winter sleep is as near death as possible. Histological studies of the minute structural changes observable in the body of a hibernating hedgehog—the most profound of the European hibernators—shows that “somnolence penetrates to the deepest recesses of the creature’s constitution.” The heart beats feebly and somewhat irregularly, breathing takes place only at long intervals and slowly, the only income is of oxygen, and the excretions are slight. The fat is slowly burnt away, the body cools down to a degree that in ordinary life would be fatal, and the senses fail to respond, except slightly to touch. Prof. Wesley Mills, who experimented largely with a dormant Canadian woodchuck, found that although you might roll it about like a football, apparently without the animal knowing it, gentle stroking of its fur produced uneasy movements of the skin as if it felt an unpleasant tickling. These sleepers may be awakened by warmth, but only to a stupid state, and close their eyes as soon as permitted.

DEEP DOWN BELOW THE REACH OF FROST



The Earthworm seems to know exactly how cold it is going to be, for he crawls down and coils up just below the frost line.

MR. BADGER GOES TO BED



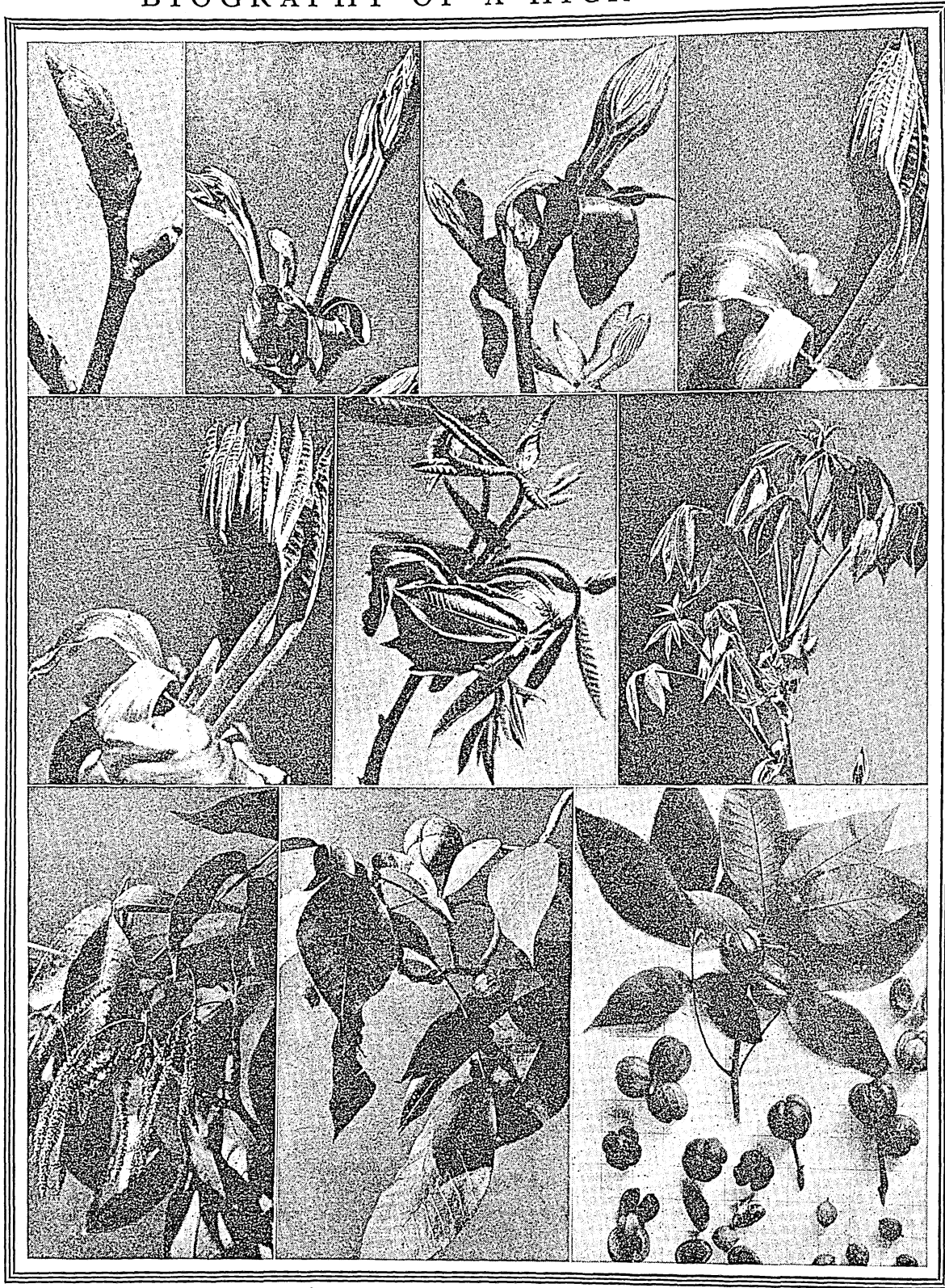
These trees must have on their autumn leaves, for it is in October that Mr. Badger goes into his burrow for the winter. When he comes out in the spring, he's in very good condition after his long fast, and not thin and weak like Mr. Bear.

“The general import of hibernation is in most cases plain,” remarks Prof. J. Arthur Thomson. “Life saves itself by ceasing to struggle, by retiring within its entrenchments. Death is baffled by a deep device, in which activity virtually ceases without life itself being surrendered.”

HICKORY. In late autumn the wood-lots resound with the laughter and shouts of the schoolchildren who eagerly search among the dry leaves for the fallen hickory nuts, gathering an abundant store with which to while away the long winter evenings. The squirrels, too, find these nuts to their liking, and chatter noisily in the tree, fearful lest the children rob them of their winter's food supply.

The hickory is an American forest tree belonging to the walnut family. It is at its best in the southeastern United States. There are about ten species. The most popular is the small nut shagbark or shellbark hickory, native from southern Maine to Florida and westward to Texas. The tree is rather large, with a spreading top covered with narrow yellowish-green leaves. The nuts when freed from their husks

BIOGRAPHY OF A HICKORY NUT



In this life story of the Hickory Nut, we first see the bud, in the upper left-hand corner. In the next six pictures we observe the opening of the leaves. Then the tree blooms. Last of all come the nuts. The ones on the last picture are of the variety known as the "shagbark" or "shellbark" hickory, which delight children and squirrels in the autumn nut-gathering season, from southern Maine to Florida and westward to Texas. The nuts when green are surrounded by tough husks, which fall off, however, when the nuts ripen, leaving the hard whitish shell exposed.

have a hard whitish shell and are finely flavored. The big shellbark is similar to the small shellbark, but the nuts are larger and have thicker shells. The nuts of almost all species are edible, being sweet and tasty.

The "pig-nut," however, is an exception, as its thin-husked nuts are bitter and astringent. The "pecan" is a species of hickory; its nuts are so valued that the tree is widely cultivated in the southern part of the United States.

The wood of the hickory is of great value for articles requiring strength combined with lightness and elasticity. It is much used for ax, pick, and tool handles, for carriage shafts and thills, and similar purposes.

Scientific name of the small shellbark, *Hicoria ovata*; of the big shellbark, *Hicoria laciniata*. Bark gray, loosely attached, breaking into long loose strips, which curve away from the tree. Leaves compound, alternate, odd-pinnate, narrow, dark yellowish-green. Fruit a whitish ovate nut inclosed in a thick four-valved hull, which (unlike the black walnut) falls away from the nut when ripe, exposing the hard tough shell.

HIEROGLYPHICS. From two Greek words meaning "sacred" and "carving"; it was used by Greek and Latin writers to describe the sacred characters of the ancient Egyptian language. It is now applied also to other systems of writing in which figures of objects take the place of purely conventional signs, such as the characters used by the Chinese. (See Writing.)

HILL, JAMES JEROME (1838-1916). The career of James J. Hill, empire builder of the Northwest, was based on one great idea. He started out in life as a poor boy, and until he was 40 he had accomplished nothing more than hundreds of other successful business men. But years before he had conceived the idea of building a great railroad system through the undeveloped Northwest; and while his friends thought it was too much of a dream to be taken seriously, he kept working and planning till finally he got his opportunity. "From the time he first conceived it," said an old friend, "he was possessed by the railroad scheme. He used to talk it at all times. He ate and drank and slept with it."

He was born near Guelph, Ontario, of Scotch-Irish parents; but upon the death of his father he left his job in a country store and came from Canada to the United States. He arrived in St. Paul, Minn., then a frontier village, when he was 18 years old, and took whatever work he could get. He was at various times shipping clerk, railroad station agent, and trader; and while he was a trader he traveled overland many times to Winnipeg, sometimes by oxcart, sometimes on horseback, and sometimes with dog sledges. In

this way he came to know the Northwest; he saw its agricultural possibilities and he learned something of the great mineral wealth that lay in the Lake Superior region. He knew that a railroad, once built through that territory, would be a success. In the meantime he did what was nearest at hand and acquired a modest fortune.

Hill's chance came in 1878. With three other men he formed a syndicate which purchased the St. Paul and Pacific Railroad, a bankrupt line into which investors had poured millions of dollars. The road had never made any profits, and though it had a valuable right-of-way leading to the Northwest, comparatively little construction work had been done.

In just 15 years Hill had not only turned failure into success, but had extended the system across the continent to Seattle. This feat was accomplished, moreover, without government assistance, though it was a time when nearly every western railroad received public land grants. In the meantime he developed steamship lines on the Great Lakes and the Pacific and made them a part of what we now call the Great Northern system.

One secret of his success as a railroad builder was his intense interest in furthering the development of the Northwest. He did not sit back and wait for the country to become prosperous; he made it prosperous by encouraging homeseekers to settle in the new territory and assisting them on the road to prosperity. Importing pedigreed horses and cattle from England, and selling

them at low prices to farmers, was typical of his methods of encouragement. In later years his sound and practical judgment on national problems of all sorts was eagerly sought.

HIMALAYA (hi-mä'lä-yä) MOUNTAINS. By comparison the Himalayan is not an extensive mountain system. Its length of 1,500 miles is but little longer than the Appalachians and its width is no greater than that of the Andes in Chile. But in elevation it is unique. From the southern of its two parallel ranges, between 40 and 50 peaks spring more than 23,000 feet in the air, overtopping all other mountains on the earth. Mount Everest, the highest of the Himalayas, is 29,141 feet, or over five and a half miles high; and the average elevation of the passes is 18,000 feet.

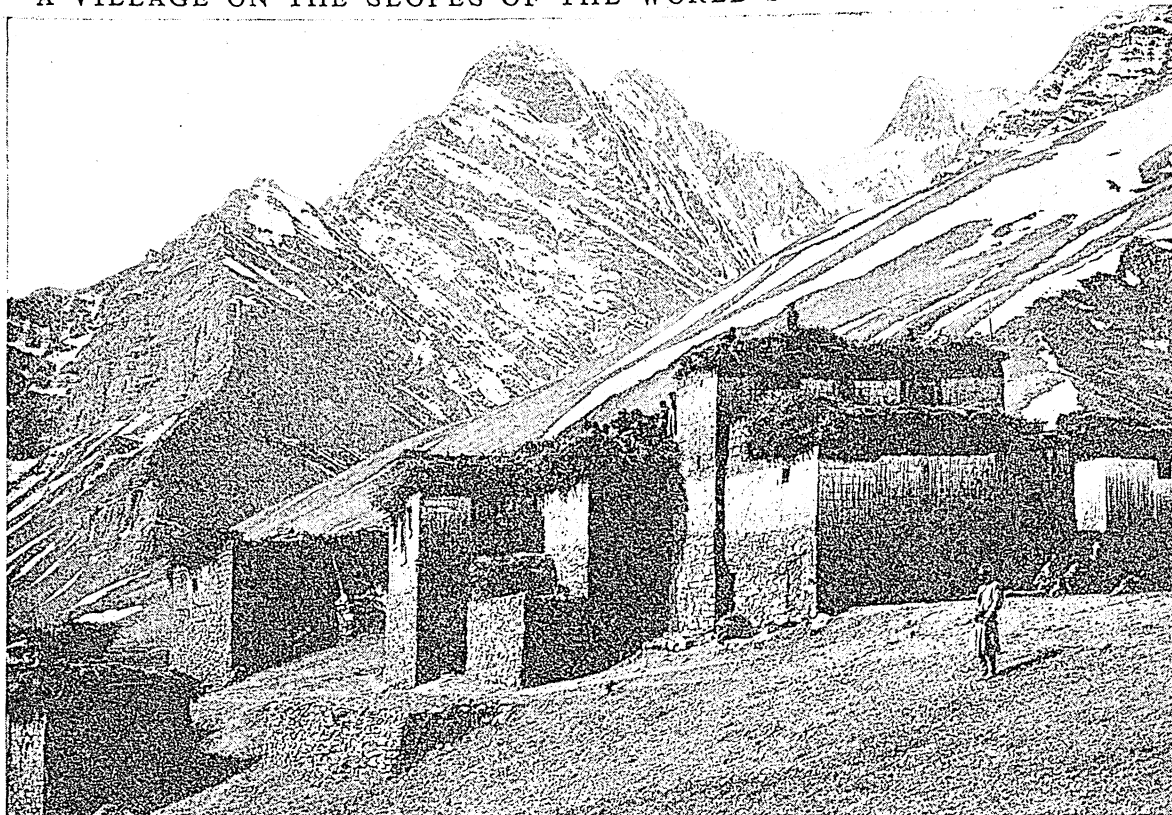
Lying on the northern frontier of India, the Himalayas extend from the great bend of the Indus River to the Brahmaputra of Indo-China, and separate the plateau of Tibet from the plains of the Ganges. They are located in the sub-tropic latitude,

THE "SHAGBARK"



The Shagbark Hickory has its name written all over it, hasn't it? And you know how the bark shells off. You can pick it out every time in the woods.

A VILLAGE ON THE SLOPES OF THE WORLD'S LOFTIEST MOUNTAINS



Life is hard for these hill people who live high up on the bleak wind-swept slopes of the Himalayas. Their stone houses are cold, dark, and smoky, with few windows to let in the cold or snow. They spend much of their time on the flat roofs, where they store their scanty crops and thresh grain. There the women spin and weave, and perform other household duties, when the weather permits.

so the snow line is lifted to 16,000 feet. The lofty southern ranges intercept the heat and moisture from the Indian Ocean. Their southern slopes are drenched with rain—more than 600 inches have fallen in a year at Cherrapunji—while the inner ranges and the Tibetan table-land are cold, dry, and half-desert.

On the southern slopes up to 5,000 feet the tea plant is cultivated. Grains and fruit are grown up to 12,000 feet, and in summer cattle are pastured up to 18,000 feet. Mountain villages are often imperiled by tigers and leopards; and snow blocks the passes from November to May. Innumerable streams and cascades from melting snow and glacier fields drop through wild gorges to swell the three great rivers of India. Simla and Darjeeling are fashionable pleasure and health resorts.

Because of the majestic height and inaccessibility of many of the summits, the native peoples have from ancient times revered the Himalayas as the home of the gods. Pilgrims still climb to the source of the sacred Ganges for seasons of prayer and penitence. The name Himalaya means, in Sanskrit, "dwelling place of the snow." (See also Everest, Mount.)

HINDENBURG, PAUL VON (1847-1934). Soon after the World War broke out, a hurried message was sent by German army headquarters to an obscure German general who had been living unnoticed in Hanover

since his retirement at the age of 64 three years before. He was asked to take command against the Russians, then pouring like a flood over the eastern borders.

The old man replied by telegraph, "I am ready," and within two weeks set the world gasping by practically annihilating the invading forces in the battle of Tannenberg in the Masurian Lakes region (see World War).

Thus Paul von Beneckendorff und Hindenburg—the names are those of his family estates—in his old age started a second career that was to make him outstanding in his generation. In August 1916, after the battle of Verdun had failed to win the war for Germany, Hindenburg was given the chief command. Next year he beat off a tremendous Allied drive to "break through" the Western front, by a stubborn defense in new positions generally called "the Hindenburg Line." In 1918 Germany was forced to ask an armistice, and it became Hindenburg's bitter duty to lead his defeated army home. He retired a second time.

But in 1925 the Conservatives of Germany asked the old field marshal, then 78 years old, to be their candidate for president. His sweeping victory caused great apprehension among the former Allies. They knew his devotion to the Hohenzollerns and feared an attempt to restore the monarchy.

Again Hindenburg surprised the world. His oath

of office, he declared, required him to defend and maintain the republic—and so he did, in spite of personal feelings. He also agreed willingly to all policies designed to reconcile Germany and her former foes, such as the Locarno Pact and entering the League of Nations, until 1933. Then the evident determination of the German people, in despair over their economic condition, to have a dictator, persuaded Hindenburg to give supreme power to Adolf Hitler. Thereafter Hindenburg became virtually inactive until his death in August 1934.

HINDUISM. Two-thirds of the people of India are Hindus, and the name "Hinduism" is given to the strangely complicated combination of religious beliefs and social customs which governs them. This system grew up through the slow transformation of very ancient beliefs. When the Aryan conquerors first appeared in northern India, about 1500 B.C., there gradually arose a series of sacred writings in Sanskrit called *Vedas*. These expressed a mystical pantheism—that is, a belief in an all-embracing spirit.

The *Vedas* show us this early Aryan society divided into four social castes—the Brahmins or priestly caste, the Kshatriyas or soldier caste, the Vaisyas or farmer class, and the Sudras or laborers. Early in their history, the Brahmins gained political as well as religious supremacy over the Kshatriyas, and established the religion called Brahmanism, set forth in writings called "Brahmanas," which are commentaries on the old *Vedas*. Gradually, pantheism gave way to a religion of personal gods, of which Brahma, the "Father of all," Vishnu, the "Preserver," and Siva, the "Destroyer," were the most important.

As the native tribes of India were conquered one by one by the Aryans, the Brahmins found it wise to allow the new converts to retain many of their old beliefs and primitive religious customs. Opposition to this adulteration of the old religion was in part responsible for the foundation in the 6th century B.C. of Buddhism and Jainism (see Buddha; India), but the Brahmins prevailed.

Today, Brahmanism has ceased to exist as a separate faith, being swamped beneath the mass of popular beliefs and rituals, and later introductions such as Mohammedanism and Christianity. Scores of sects have grown up, some emphasizing the worship of Vishnu, others of Siva, others setting up newer gods and goddesses. Most of the sects base their practices upon popular religious treatises of comparatively recent origin, called "puranas." At the same time the old fourfold caste system has split into thousands of branches and sub-castes, each with its peculiar rites and restrictions.

Most true followers of Hinduism, however, continue to look upon the Brahmin caste as their leaders, and to observe broadly similar rules regarding food, marriage, and burial. One of the most interesting of the Hindu beliefs is the transmigration of souls, or "metempsychosis." According to this doctrine the soul of a person passes at death into some other

creature, either human or animal. If the person has led a good life, the soul goes upward in the scale—a low-caste, for instance, is reborn as a high-caste; but if the person has led an evil life, the soul may pass into the body of a dog or a pig or any other animal. Everything in this life, say the Hindus, is a consequence of actions performed in a previous existence, and only by the gradual building up of a fine record or "karma" can final salvation be achieved. This doctrine is a very old one and was taken over in large part by the Buddhists when they split off from Brahmanism.

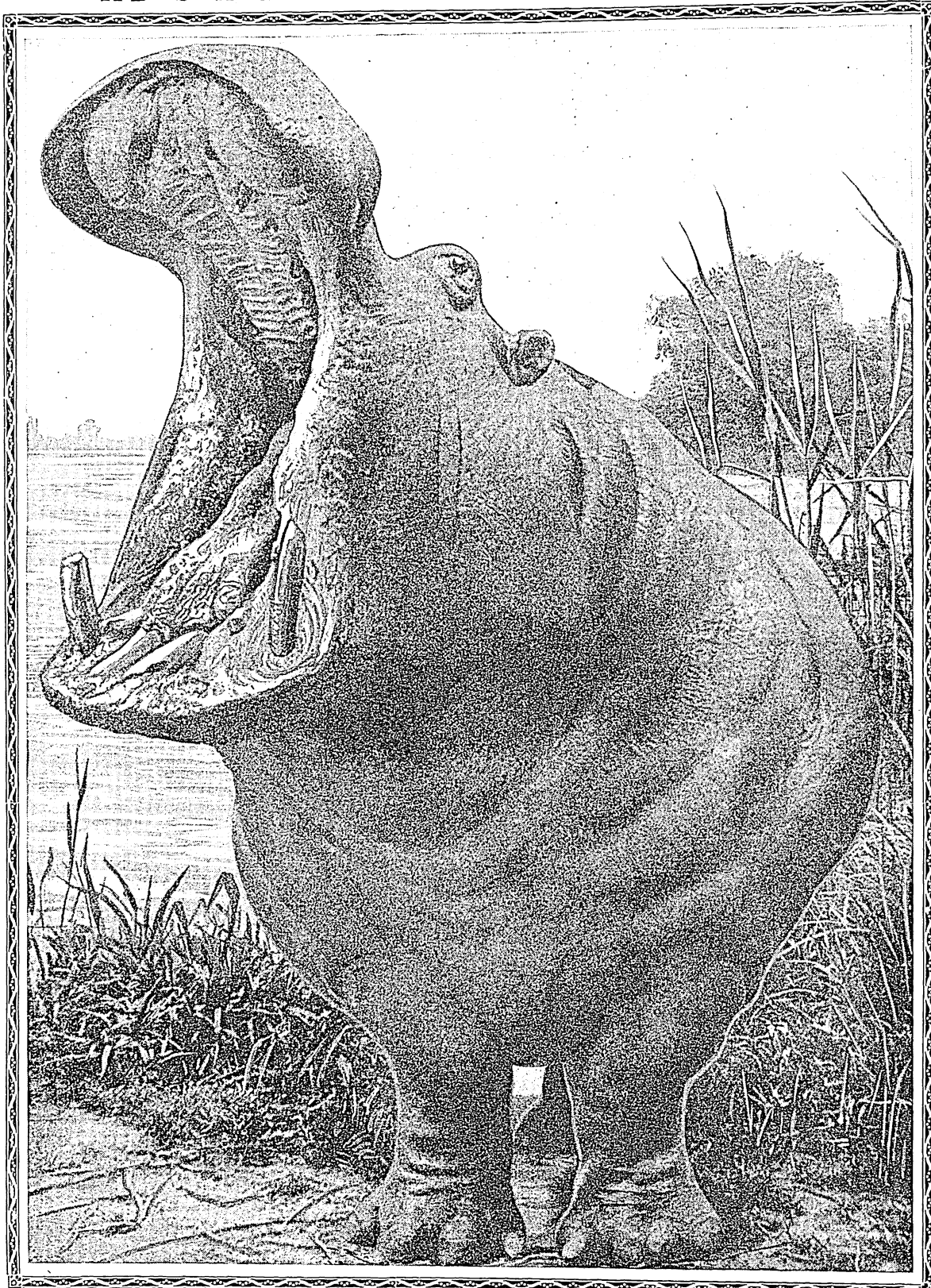
The Hindu gods are supposed to have undergone a series of incarnations or "avatars" similar to those through which men must pass. Thus the god Krishna is looked upon merely as a form of the god Vishnu.

HIPPOPOTAMUS. The features that make a hippopotamus at first sight seem grotesque are in reality extremely useful to the animal in its peculiar method of life. The nostrils, the protruding eyes, and the ears are set on the upper surface of the flat face so that they alone project above water when the "hippo" swims, leaving the great head concealed. The enormous "scoop-shovel" mouth is suited to gathering in plants from the bottom of lakes and streams. The smooth barrel-shaped body is well fitted for under-water travel.

The name hippopotamus means "river-horse," but this African animal is really related to the pigs. The hippopotamus shares honors with the rhinoceros as the largest land mammal next to the elephant. Adults commonly measure 12 to 14 feet in length and 5 feet or more in height at the shoulder. Large specimens may weigh as much as 4 tons. The body is covered with a hide $1\frac{1}{2}$ inches thick on its back and sides, and hairless except at the tip of the tail. Its huge red mouth is furnished with large teeth—tusks in the lower jaw. It can close its large nostrils and short ears when under water.

During the day the hippopotamus remains in the water, often in herds of 20 to 40. At times it disappears beneath the water for 8 or 10 minutes at a time, spouting and snorting when it comes to the surface. When excited or in pain the body is covered with drops of a reddish fluid, which gives rise to the saying that the hippopotamus "sweats blood"; but the blood forms no part of this reddish sweat. At night the hippopotamuses (or hippopotami) go to pasture, feeding on water plants and grasses. They often journey 8 or 9 miles in search of good pasture and sometimes make inroads on cultivated fields. For this reason they have been exterminated in most settled districts. The natives also hunt the hippopotamus for its flesh as well as for its teeth, which are superior to ivory in hardness. The explorer Sir Samuel Baker says of a wounded hippopotamus, which he saw leave the water and gallop savagely inland: "I never could have imagined that so unwieldy an animal could have exhibited such speed. No man could have had a chance of escape."

HE'S A LITTLE TIRED—THAT'S ALL



You really couldn't ask a Hippopotamus to cover up his mouth when he yawns. It would take a bale of hay to conceal that cavity. In spite of his fearful looking pair of jaws, the "Water Horse" is timid and inoffensive unless he is infuriated. With those long tusks he can root up grass like a steam plow.

Though formerly plentiful in Egypt, the hippopotamus is now found only in equatorial Africa. It is thought that the common hippopotamus was found formerly in the Jordan valley also, and that it is the "behemoth" mentioned in the Bible. It is not difficult to keep in captivity. For many years a hippopotamus named "Miss Murphy" was to be seen in Central Park, New York, and it was always a

delight to children to see the skill with which she caught in her huge mouth the loaves of bread tossed to her at feeding time.

In addition to the common hippopotamus there is a pygmy species (*Hippopotamus liberiensis*), about 2½ feet high and 6 feet long, which weighs when full grown only about 400 pounds. This species is found chiefly in Liberia and neighboring regions.



HISTORY. To read history is like visiting strange far-off lands. Like travel, it takes us out of the narrowness and commonplace of everyday life, and shows us the wonderful panorama or moving picture of man in his slow ascent from earliest savagery to modern civilization. The stupendous series goes back to "the times of the old patriarchs with their flocks and herds, the keen-eyed Greek, the stately Roman, the watching Jew, the uncouth Goth, the horrid Hun, the settled picture of the unchanging East, the restless shifting of the rapid West, the rise of the cold and classical civilization, its fall, the rough impetuous Middle Ages, the vague warm picture of ourselves and home."

Someone has said that "History is Philosophy teaching by example." Certainly to be "historically minded" is to see things in relation and in perspective, to judge tolerantly, remembering how differently men have thought and acted in different times, and always to keep an open mind, ready to receive and weigh new evidence. If one grasps this idea, he will never think that being a historian means an ability to remember dates. That childish idea is like calling a man a statesman who can remember the names of voters in his districts. A waiter could

remember more names and a telephone operator more numbers than the greatest historian.

The true historian is not content to take all his facts from other historians. Today he makes sure that his statements are based on sound "documents" or "sources" which go back to the time of the facts themselves. Those sources are of all kinds—ruined monuments, old tombs, and other material remains; legal papers, letters, diaries, newspapers, and written or printed narratives of eye-witnesses, even myths and fables; contemporary pictures, drawings, photographs, and the like. Sometimes the discovery or the finding the key to new sources—such as the hieroglyphs of ancient Egypt or the cuneiform tablets of Babylonia and Assyria—adds whole new realms to our historical knowledge.

But the historian needs continually to be on his guard not to be misled by his sources. A document may be entirely forged; its author may be deliberately lying; he may be so prejudiced by national, religious, party, or personal bias as to be grossly unfair to the other side; and if honest, he may be misinformed as to the facts and mistaken in his inferences. Scores of pitfalls must be avoided by the research worker in this fascinating field.

Anyone who reads the accounts published in the different countries concerning the causes and results of wars, or who sees how widely the reports of political affairs in Republican newspapers differ from those in Democratic ones today, will realize that the historian needs caution and training in handling his sources.

"Criticism for good faith and accuracy" has become a special branch of learning. Every trained historian asks, "Did this writer mean to tell the truth?"

And second, "Was he in a position or frame of mind to tell the truth even if he wanted to?" Every statement therefore must be patiently weighed and tested, and combined with all other available information to get at the truth. As a result of such training it has well been said that "by the mechanism now at his command the scientific explorer can read more history from the dust heaps of Abydos than Herodotus, the greatest traveler of antiquity, could gather from the Egyptian priests of Saïs."

Formerly history was regarded chiefly as a branch of literature, and a pleasing style was considered of first importance.

Today the emphasis is placed, as in science and other branches of study, mainly upon accuracy of facts, and the soundness and breadth of the understanding which the historian presents of man's life in the period with which he deals.

History is really a ceaselessly flowing stream, ever widening and deepening its course; but for convenience we divide it into more or less artificial periods. This does no harm if we remember that changes in history, like changes of the seasons, are gradual, and each period passes into the next as imperceptibly as winter into spring, or as life undergoes the slow but constant changes from childhood to youth, manhood, and old age.

To the long period before written records begin when man was taking his first steps in the arts which make up civilization, we give the name Prehistoric Age (see Stone Age). Ancient History covers more than half the span of our recorded knowledge. It stretches from the beginnings of Assyrian and Egyptian inscriptions, through "the glory that was Greece, the grandeur that was Rome," to the coming into the Roman Empire of the Germanic barbarians who overthrew classical civilization (about 3000 B.C. to about 375 A.D.).

The Middle Ages extend from 375 A.D. to about 1500. This period starts with an epoch of confusion and transition which lasts to about 800 A.D.; to it (if anywhere) the term "Dark Age" may be applied.

Then comes the height of the Middle Ages, from Charlemagne to Dante (800 to 1300), when feudalism, monasticism, scholasticism, the Crusades, and Gothic architecture flourished, and a world empire and a world papacy confronted each other and strove for mastery. The period closes with a second epoch of transition (1300 to 1500), which we call the Renaissance (see Renaissance). Since 1500 we have the Modern Period, characterized by the organization into national states, the spread of discovery and

European settlement, the progress of science and inventions, and the rise of democracy.

Altogether, written records go back only about 5,000 years. Geologists, however, believe that the earth is at least 100,000,000 years old, and that man has perhaps inhabited it for 50,000 years. To give some idea of the short duration of recorded history compared with this vast expanse of time, Prof. J. H. Robinson asks us to imagine a library of ten volumes of a thousand pages each, one page for every 5,000 years that the earth has existed. The whole of recorded history from the earliest Assyrian and Egyptian inscriptions to the

present day would scarcely cover the last page of that stupendous journal!

If history as a study is often dull and dry, a mere catalog of names and dates of rulers and battles and treaties, it is the fault of the books and not of history itself. Nothing can be more fascinating than the true story of how men and women have lived their lives in the past and in far distant lands—their houses, food and clothing, how they cultivated their fields and manufactured goods and traded with their neighbors, the games their children played and the parents' beliefs about God and the world of Nature, their laws and manner of government, the songs their poets sang and the beautiful things their artists made. All of this is included in the history which scholars today study and teach.

Even wars and political struggles are interesting when we once know what they were about and how they were carried on, and become well enough acquainted with the heroes and leaders to feel that they were real men and women dealing with things that were of vast importance to their peoples. The great English historian Freeman once wrote that "History is past Politics and Politics present History." But this view, equally with the "drum and trumpet" view of history, is too narrow; and today the historian includes in his survey the whole life of man in the past as discoverable from documents and all other "sources" which may shed light on the subject.

"In a certain sense all men are historians. Is not every memory written quite full with Annals, wherein joy and mourning, conquest and loss manifoldly alternate; and, with or without philosophy, the whole fortunes of one little inward Kingdom and all its politics, foreign and domestic, stand ineffaceably recorded. . . . Thus, as we do nothing but enact History, we say little but recite it: nay rather, in that widest sense, our whole spiritual life is built thereon. For, strictly considered, what is all Knowledge too but recorded Experience, and a product of History; of which, therefore, Reasoning and Belief, no less than Action and Passion are essential materials?"—Thomas Carlyle.

HISTORY SHOWN IN CHARTS

HISTORICAL charts are to history what maps are to geography. They help us to visualize the facts—to fix them in *time* as maps do in *space*—and so aid both the understanding and memory. When the history of the chief countries is shown in parallel columns, as here, there is the added advantage of "synchronizing" the events.

A glance across these pages will enable you to see at once what was happening in the different countries in any period. Thus a student will quickly find that when the Greeks were besieging Troy, the great empire in Egypt was already declining, Samuel was ruling in Israel, and Tiglath-Pileser I and his wandering armies were gazing out across the Mediterranean. He will learn that some of the Norman

knights who invaded England with William the Conqueror lived to take part in the First Crusade, and that shortly before that conquest the Northmen discovered America; and that in the same century that the Puritans were settling Plymouth and Boston, there was revolution and civil war in England. Huguenots were persecuted in France, a great religious war was fought in Germany, and the Dutch finally won their independence from Spain. This graphic arrangement of contemporaneous events is particularly valuable in teaching the student to regard history, not as a collection of disconnected incidents, but as a series of related movements, each contributing to the story of civilization and the development of the customs and character of men.

PREHISTORIC PERIOD

125,000(?)–10,000(?) B.C. Old Stone Age. 25,000(?). Last Glacial Age Ends. 10,000(?). Neolithic (New Stone) Age Begins

HISTORIC PERIOD — I. ANCIENT HISTORY

B. C.	EGYPT	PALESTINE AND SYRIA	BABYLONIA AND ASSYRIA	AEGEAN REGION AND GREECE	ITALY
	New Stone Age in Nile Valley. Pre-dynastic period; many little kingdoms. 4241. First fixed date in history; Egyptian calendar established. 3400. Menes unites Egypt into one kingdom; beginning of dynastic period.		5000–2750. Sumerian city kingdoms (non-Semitic). Early development of cuneiform writing.	New Stone Age in Crete before 4000.	New Stone Age in Italy.
3000	3000–2500. PYRAMID AGE; high cultural development under IVth Dynasty; capital at Memphis (lower Egypt). Great Pyramid at Gizeh (2900). 2400. Removal of capital to Thebes (upper Egypt).	3000–2500. Canaanites, a Semitic people, move into Palestine. 2550–2000. Phoenicians (another wave of Semites) settle in Palestine.	2750–2550. Semites under Sargon of Akkad conquer Sumeria. 2500–2200. Rule of Semitic kings of Sumer and Akkad; Babylonian Empire. 2130–2090. Hammurabi of Babylon conquers Akkad and Sumeria (code of laws issued).	3000–2800. Transition from Stone to Bronze Age. Dawn of European civilization in Crete. 2800–1200. Minoan Age in Crete; high civilization with capital at Cnossus. 2500–2000. Second city of Troy flourished.	
2000	2000–1800. Height of FEUDAL AGE. 1800–1600(?). Hyksos kings. 1580. Founding of New Empire (XVIIIth Dynasty). 1501–1447. Thutmose III conquers Palestine, Phoenicia, and Syria; greatest conqueror among Pharaohs. 1411–1375. Amenhotep III; magnificent palaces and temples at Thebes. 1375. Amenhotep IV (Ikhnaton) tries to reform old religion. 1225(?). Rameses II (Sesostris) completes Great Hall at Karnak. 1150. Beginning of Egyptian decline.	2000. Abraham leaves Ur, in southern Babylonia; enters southern Palestine. 1550. Joseph and his brethren go into Egypt. 1400–1200. Great immigration of Hebrews (Jews) into Canaan. 1225(?). Moses leads Jews out of Egypt; the Ten Commandments. 1200–1030. Rule of Judges; Samuel the last judge. 1030. Saul becomes first king of the Jews.	1900. Assyria (north) settled by immigrants from Babylonia (south). Kassite immigrants from Elam gradually absorb power in Babylonia and establish Kassite dynasty (1780–1200?). 1400. Babylonia has well-established diplomatic and commercial relations with Egypt. 1300. Constant wars of Assyria with Babylonia. 1100. Tiglath-Pileser I of Assyria conquers to the Mediterranean.	2000–1500. 3d, 4th, 5th, and 6th cities of Troy. 1500–1200. 7th city of Troy (Homeric city). 1500–1450. GOLDEN AGE OF CRETE. 1500–1100. Greatness of Mycenae, Tiryns, etc. 1450–1200. Hittite Empire in Asia Minor. 1500–1000. Greek (Achaean) colonization of Greece and islands. Dorian and Ionian conquests and colonization follow. 1200. Fall of Troy following siege by Greeks; gradual growth of hero songs about the siege.	2000. Lake dwellers occupy Italian lakes.
1000		1000. David becomes king; capital at Jerusalem. 1000–700. Phoenician cities at height of their power. 960. Solomon becomes king; temple dedicated. 930. Kingdom divided into Israel and Judah. 926. Jerusalem plundered by Egyptians.		1000–900. Greek colonization of Aegean islands and Asia Minor extended.	1000. Etruscans come into Italy (probably from Asia Minor by sea). 1000. Latin villages established along Tiber.
900	945. Libyan rulers succeed line of priestly rulers of Thebes (XXIst Dynasty). 926. Sheshonk I plunders Jerusalem (XXIId Dynasty).	Period of the Prophets (Elijah, Elisha).	930–626(?). Brilliant period of Assyrian history (great activity in architecture, literature, and sculpture as well as in military conquests). 885–860. Assurnazirpal restores the empire of Tiglath-Pileser I; marches to Mediterranean.	900–800. 'Iliad' and 'Odyssey' composed (by Homer?). 820. Lycurgus frames laws for Sparta.	
800	800. Egypt again divided among many small kingdoms (XXIIId Dynasty).	The Prophets: Amos, Joel, Hezekiah, Isaiah.	750–606. ASSYRIAN EMPIRE at its height. 742–727. Babylonia subjugated by Tiglath-Pileser III of Assyria. Assyrian rule extended to Egypt.	800–700. Rise of aristocracies in Greece. 776. Traditional date of first record of Olympic games (1st Olympiad). 750–650. Sparta conquers Messenia; becomes a military power.	753 (traditional date). Rome founded. 750. Etruscan kings invade Latin towns.

I. ANCIENT HISTORY (Continued)

B. C.	EGYPT	PALESTINE AND SYRIA	BABYLONIA, ASSYRIA, AND PERSIA	GREECE	ITALY AND ROME
700	722. Ethiopian rulers gain Egyptian throne (XXVth Dynasty). 670-661. Assyrians conquer Egypt; plunder Thebes. 663. Egyptian rulers restored (XXVIth Dynasty); revival of power and art. 609-594. Necho II digs canal from Nile to Red Sea; Africa circumnavigated.	722. Israel destroyed; people carried to Assyria. 701(?). Assyrians besiege Jerusalem (Isalah's prophecies). Prophet Jeremiah.	722-705. Conquests of Sargon II (palace of Nineveh). 722. Conquest of Israel; people made captive. 705-681. Sennacherib; walls and temples of Babylon razed following revolt. 681-668. Esarhaddon; Assyria at its height. 640. Revolt of the Medes. 606-604. Chaldeans move into Assyria from the desert; Nineveh destroyed; end of Assyrian Empire. 606-539. CHALDEAN (NEW BABYLONIAN) EMPIRE. 604-561. Nebuchadnezzar; wars in Palestine and Syria; Hanging Gardens of Babylon built.	734 (traditional date). Syracuse founded in Sicily. 708. Tarentum founded in Southern Italy 650-600. Rise of tyrannies in Ionia; established in Corinth, Megara, etc. 630. Cyrene founded in Africa. 621. Code of Laws for Athens issued by Draco.	700. Greek colonies in Sicily and Southern Italy.
600	525. Psammetichus III conquered; Egypt a Persian province.	586. Jerusalem captured by Babylonians; temple burned (Babylonian captivity). 539. Return of Jews; temple rebuilt; Palestine subject to Persia (until 332). Prophet Zechariah.	586. Capture of Jerusalem; Jews carried to Babylon. 539. Babylon taken by Cyrus the Great; becomes Persian province. 539-330. MEDO-PERSIAN EMPIRE. Lydia conquered (capture of Sardis, 546). 528-521. Cambyses; conquers Egypt. 521-485. Darius I rules from Aegean and Egypt to India; advances to Danube against Scythians (513); revolt of Greeks in Asia Minor (500); two expeditions against Greece (493, 490).	594-593. Solon, archon of Athens, reforms Athenian constitution. 560-527. Pisistratus tyrant of Athens. 514. Hipparchus, son of Pisistratus, slain by Harmodius and Aristogiton; his brother Hippias expelled, 510. 509. Reforms of Cleisthenes at Athens.	510 (traditional date). Kings (Etruscans?) expelled from Rome; republic founded.
500	Frequent revolts against Persian rule.	458. Ezra returns to Jerusalem. 445. Nehemiah rebuilds Jerusalem. Malachi last of the Old Testament writers.	486-465. Xerxes. Great expedition against Greece (480). Internal decay of Persian Empire; frequent revolts of Egypt, etc. 401. Unsuccessful revolt of Cyrus the Younger against his brother, Artaxerxes II; retreat of Xenophon and the 10,000 Greeks.	500. Athens aids Greeks of Asia Minor against Persia. 493-492. Themistocles archon of Athens. 493-479. Persian Wars. Darius sends expedition into Thrace and Macedonia (493); attacks Greece (Marathon, 490); Xerxes invades Greece (Thermopylae and Salamis, 480; Plataea, 479). 478. An Athenian Empire founded by Confederacy of Delos, against Persians; Athens and Sparta at head of rival leagues. 444-429. AGE OF PERICLES, height of Athenian culture. (Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides, Phidias, Ictinus, Socrates, Zeno.) Acropolis developed; Parthenon built. 431-404. Peloponnesian Wars between Athenian and Spartan alliances; Athenian expedition to Syracuse unsuccessful (415-413); Spartans besiege Athens (413-404); Athenian fleet destroyed at Aegospotami (405); surrender of Athens.	494. Struggle between Patricians and Plebeians; tribunes created. 450. Roman laws made public (12 tables).
400	414. Successful revolt re-establishes Egyptian independence for 60 years.	Sidon chief city of Phoenicia.	362-338. Artaxerxes III King of Persia; poisoned by his Egyptian favorite Bagoas.	399. Socrates put to death in Athens. 379-362. War between Sparta and Thebes (Epaminondas); Leuctra (371); leadership passes to Thebans. 357-355. Revolt of Athens' allies destroys Athenian Empire. 350-336. Rise of Macedon to power under Philip (power of Thebes destroyed at Chaeronea, 338). Macedonian supremacy in Greece. 336-323. Alexander the Great. Invades Asia and founds Greek (Hellenistic) power of far-reaching influence.	396. Romans take Veil after 10 years' siege; end danger from Etruscans. 390. Gauls plunder Rome (Battle of the Allia). 367. Licinian laws passed to equalize Patricians and Plebeians.
MACEDONIAN EMPIRE					
334. Alexander attacks Persian Empire (Battle of the Granicus, 334; of Issus, 333; of Arbela, 331). 332. Palestine conquered by Alexander. 332. Alexander conquers Egypt from Persia and founds Alexandria. 330. Darius III slain while fleeing after Arbela; end of Persian Empire. 323-276. Wars among the successors of Alexander (Diadochi), who divide the Macedonian Empire.					
	EGYPT	PALESTINE	SYRIA AND ASSYRIA	GREECE	
	323-30 B.C. Ptolemies (descendants of one of Alexander's generals) rule Egypt; great library at Alexandria.	323-276. Ptolemies rule Palestine.	312-281. Seleucus, son of one of Alexander's generals, rules from Syria to the Indies (his descendants called Seleucids).	323-146. Macedonia and Greece under Demetrius Poliorcetes and his descendants. 323-322. Greek states fail in revolt against Macedonians.	326-304. Second Samnite War. Roman army defeated in the Caudine Forks and sent "under the yoke" (321). Victories of Romans at Vadimonium Lake (310) and Bovianum (305) end the war. Rome becomes the dominant power of Italy south of the Rubicon River.

I. ANCIENT HISTORY (Concluded)

B. C.	EGYPT	PALESTINE	SYRIA AND ASSYRIA	GREECE	ROME
300	285-247. Ptolemy II (Philadelphus); brilliant court at Alexandria; Egypt's navy rules eastern Mediterranean.	276. Antiochus of Syria conquers Palestine from Egypt.	250. Parthians under Arsaces revolt. 223-187. Antiochus the Great; defeated by Romans at Magnesia (190); Seleucid rule curtailed in west.	280-183. Aetolian and Achaean Leagues prevent Macedonia securing complete power in Greece.	282-272. War with Tarentum aided by King Pyrrhus of Epirus. 264-241. First War with Carthage (over Sicily). Rome becomes a naval power, invades Africa and Sicily, and defeats Carthage in numerous battles at sea. Rome gains Sicily. 218-202. Second War with Carthage. Hannibal invades Italy over the Alps; defeats Romans at Cannae (216); Scipio carries the war into Africa (204), and defeats Hannibal at Zama (202). Carthage becomes a vassal state. 215-206. First Macedonian War.
200	Decline of Egypt; frequent wars of Ptolemies with the Seleucids of Syria.	167-130. Maccabees (kings) rule Palestine as Roman vassals.	174-136. Mithridates I founds Parthian Empire (Media, Persia, Babylonia, etc.).	197. Macedonians defeated at Cynoscephalae by Romans, and Greece freed from Macedonian rule. 146. Achaean League defeated by Romans and Corinth destroyed. Greece passes under Roman rule.	200-197. Second Macedonian War; Greece freed. 190. Antiochus of Syria overthrown (western Asia Minor under Roman control). 171-168. Third Macedonian War; end of Macedonian monarchy. 149-146. Third War with Carthage; Carthage destroyed. 146. Macedonia becomes a Roman province. 133. Practically all Spain under Roman rule.
100	Civil wars among degenerate Ptolemies pave way for fall. 47. Cleopatra made ruler of Egypt under Roman supremacy. 31. Cleopatra and Antony defeated at Actium. Egypt becomes a Roman province.	63. Pompey makes Jews tributary to Rome. 40. Herod (the Great) recognized by Rome as dependent king of Judaea. 4. Birth of Christ.	88-64. Mithridates VI (the Great) defeated by Romans; Syria and Armenia submit to Rome.	133-123. Tiberius and Caius Gracchus attempt to reform the land laws and are slain. 113-101. Cimbri and Teutones (Germanic invaders) defeated by Marius.	90. Roman citizenship granted to all Latins and most other Italians, following revolt of Rome's allies ("Social War," 90-88). 88-82. Civil War between Sulla (wealthy classes) and Marius (poorer classes). Reactionary reign of terror under Sulla as dictator. 73-71. Revolt of gladiators and slaves under Spartacus. 66-62. Catiline's conspiracy (Cicero's speeches). 60. Caesar, Pompey, and Crassus form first Triumvirate. 58-51. Caesar conquers Gaul; two expeditions to Britain (55-54 B.C.). 49-48. Civil war between Caesar and Pompey (Battle of Pharsalus; Pompey slain). Under forms of the republic, Caesar gets all power into his own hands. 44. Assassination of Caesar by Brutus, Cassius, and others. 43-42. Mark Antony, Octavian (Augustus), and Lepidus form second Triumvirate and defeat Cassius and Brutus at Philippi. 31-30. War between Octavian and Antony; Antony and Cleopatra of Egypt defeated at Actium. 31 B.C.-14 A.D. Octavian rules as Emperor Augustus. Beginning of ROMAN EMPIRE. (Golden Age of Roman culture; Livy, Horace, Vergil, Seneca, Pliny the Elder.)
TIME B.C.					
TIME A.D.					
100	Under Roman rule Egypt enjoys a period of industrial and commercial prosperity.	6. Judaea becomes part of Roman province of Syria. 70. Jerusalem destroyed by Titus following revolt. Dispersal of survivors.		14-37. Tiberius emperor (stepson of Augustus). 37-41. Caligula (great-grandson of Augustus). 41-54. Claudius; Britain added to Roman Empire. 54-68. Nero; his crimes and excesses; great fire in Rome; Christians persecuted. 69-79. Vespasian proclaimed emperor by his troops in Syria; good rule. 79-81. Titus (son of Vespasian). 79. Eruption of Vesuvius destroys Pompeii and Herculaneum. 98-117. Trajan, a Spaniard by birth and a great general (conquest of Dacia; defeat of Parthians in Syria; Empire reaches greatest extent).	
200	Revolt of native troops begins decline of Egypt.	132-135. Revolt of Jews suppressed by Hadrian; survivors dispersed.	114-116. Armenia, Mesopotamia, and Assyria made Roman provinces. 193-211. Northern Assyria conquered by Rome.	117-138. Hadrian adopted by Trajan; frontiers strengthened; Asia east of Euphrates given up; magnificent buildings. 138-161. Antoninus Pius. 161-180. Marcus Aurelius, adopted son of Antoninus and a renowned Stoic philosopher. Wars with barbarians along Danube. 193-284. Emperors elected by the army. 193-211. Septimius Severus; war in Mesopotamia; northern Assyria conquered.	212. All freemen in the Empire made citizens (to get more taxes). 270-275. Aurelian; recovers Palmyra and subdues revolt in Gaul; new walls about Rome. 284-305. Diocletian (resides in East); empire divided into four administrative prefectures; great persecution of Christians; abdicates.
300	270. Egypt occupied by Zenobia of Palmyra. 273. Egypt reconquered by Rome.		226-241. New Persian Empire under Sasanids. 267-273. Zenobia, queen of Palmyra, defeated by Aurelian.	311. Christianity made legal. 323-337. Constantine the Great sole ruler; capital removed to Constantinople; empire reorganized. 325. Council of Christian church at Nicaea. 375. Beginning of TEUTONIC MIGRATIONS into the Empire. 378. Visigoths defeat Roman army at Adrianople. 379-395. Theodosius the Great, last ruler of united empire. 395. Empire divided into Eastern and Western parts.	
400	Quarrels between branches of the Christian Church lead to persecution of the Arians.			395-476. WESTERN EMPIRE. 410. Alaric the Visigoth captures Rome. 455. Vandals from Africa sack Rome. 476. German leader Odoacer deposes last Roman emperor in West.	395-1453. EASTERN OR BYZANTINE EMPIRE. For nearly 1,000 years a defense against Asiatic invasions.

WESTERN EUROPE

ENGLAND

EASTERN EUROPE AND OTHER COUNTRIES

383-394. Wars for power among claimants of Empire in West ended by recognition of Theodosius (see Eastern Europe).
395-423. Honorius receives Western Roman Empire on permanent division (Stilicho, his minister).

410. Sack of Rome by Visigoths under Alaric; Visigoths move into Spain (414).

429. Vandals cross from Spain into Africa; under Genseric plunder Rome.

451. Attila the Hun defeated at Châlons (in Gaul).

476. Odoacer, German mercenary, displaces Roman emperor; end of Western Roman Empire.

481-511. Clovis founds kingdom of Franks in Gaul (Merovingians); becomes Christian (496).

493-555. Ostrogoths (Theodoric the Great) rule Italy.

511-751. Decline of Merovingian kings of Franks and rise of Mayors of Palace.

568-774. Lombard kingdom in Italy.

590-604. Pope Gregory I (the Great); Rome the head of Christendom.

613. Queen Brunhilde of Austrasia (Eastern Frank-land) captured, tortured, and dragged to death by wild horses in Merovingian quarrels.

687. Pepin of Heristal becomes Mayor of Palace for whole Frankish kingdom (Battle of Testry).

711. Mohammedans from Africa overthrow Visigothic kingdom in Spain.

732. Franks (Charles Martel) defeat Mohammedans at Tours (in France).

751. Pepin the Short (Mayor of the Palace) deposes last Merovingian king and takes the crown (Carolingian rule).

800. Charlemagne, king of the Franks and ruler of most of western Europe (768-814), crowned emperor at Rome.

843. Partition of Verdun. Charlemagne's empire divided; separation of France and Germany.

FRANCE

911. Normandy ceded to Rolf (Rollo), the Northman; decline of Carolingians in France.

987. Hugh Capet chosen king (Capetian line); Feudalism at height of its power.

1096. Council of Clermont; Pope Urban II calls First Crusade.

GERMANY AND ITALY

911-918. Conrad I (Franconian) first non-Carolingian king.

936-973. Otto I, the Great (Saxon), ends anarchy in Italy; defeats Hungarians (955); revives Empire (962).

1002-24. Henry II (the Saint), last of the Saxon line.

1075. Investiture conflict begun by Pope Gregory VII (Hildebrand) and Emperor Henry IV (1056-1106).

Romans rule Britain since about 43-81 A.D.; Christianity introduced; Hadrian's wall begun (121).

410. Roman legions withdrawn.

449-700. Angles, Saxons, and Jutes conquer Britain ("Angleland" or England).

577. Battle of Deorham; West Saxons reach Bristol Channel.

597. Augustine reintroduces Christianity.

607. Chester sacked and left desolate for 300 years.

755-794. Offa king of Mercia.

827. Egbert of Wessex unites England.

871-899. Alfred rules southern England; Danes checked.

910-954. Northern England ("Danelaw") reconquered from Danes.

980. Danish invasions renewed.

1016-1035. Canute of Denmark king.

1042-66. Edward the Confessor king.

1066. Norman conquest (William I).

375. Visigoths cross Danube; defeat Romans at Adrianople (378).

395. Death of Theodosius the Great, last ruler of united Roman Empire.

395-1453. EAST ROMAN EMPIRE (Arcadius emperor, 395-408).

474-491. Zeno eastern emperor.

527-565. Justinian emperor; Roman law codified; Vandals in Africa and Ostrogoths in Italy overthrown.

622. Mohammed's flight from Mecca (the "Hegira"); founding of Mohammedan religion.

750. Mohammedans rule all western Asia, northern Africa, and Spain—from Indus River to the Pyrenees.

809. End of brilliant reign of Harun-al-Raschid, calif of Bagdad.

862. Russian kingdom founded by Rurik the Northman (Kieff, capital).

905-959. Constantine VII ("Born in the Purple") emperor, patron of literature.

1000. Northmen discover America (Greenland discovered, 984).

PERIOD OF THE CRUSADES—TO RESCUE PALESTINE FROM MOHAMMEDAN RULE—1096-1291

1096-99. First Crusade. People's crusade under Peter the Hermit fails. Crusade of nobles under Godfrey of Bouillon and others takes Jerusalem (1099) and establishes a feudal kingdom of Jerusalem.

1108-37. Louis VI (the Fat) establishes order in crown possessions.

1122. Concordat of Worms ends investiture conflict.

1100-35. Henry I ("the Lion of Justice"); a charter issued.

1144. Edessa taken by Mohammedans.

1147-49. Second Crusade. Preached by St. Bernard of Clairvaux; led by Conrad III of Germany and Louis VII of France without results.

1180-1223. Philip Augustus; recovers Normandy, etc., from England.

1152-1190. Frederick Barbarossa (Hohenstaufen); quarrel with pope; defeated by league of Lombard towns.

1154-89. Henry II (Plantagenet) holds Normandy, Anjou, Maine, etc., in France. Conquest of Ireland begun.

1187. Capture of Jerusalem by Saladin.

1189-92. Third Crusade. Led by Richard Coeur de Lion of England and Philip Augustus of France; Emperor Frederick Barbarossa drowned on way. Armistice with Saladin permits pilgrimages to Holy Places.

1209-29. Albigensian crusade. 1214. Battle of Bouvines; defeat of English and enemies of Frederick II.

1215-50. Frederick II; rules Naples and Sicily as well as Empire; quarrels with pope; Fifth Crusade (1228-29). 1254-73. Interregnum in Empire.

1204-06. King John loses Normandy and Anjou; forced to grant Magna Carta (1215).

1202-04. Fourth Crusade directed against Constantinople by Venetians.

1226-70. Louis IX (St. Louis); good rule. Crusade to Egypt (1248-54); to Tunis (1270). 1285-1314. Philip IV (the Fair). Power of king increased; quarrels with pope.

1273-91. Rudolph of Hapsburg king of Germany.

1272-1307. Edward I; conquest of Wales (1282); wars with Scotland begun.

1206-27. Genghis Khan conquers China, Persia, Turkestan, and Southern Russia.

1302. First meeting of Estates-General.

1300-1500. Dante, Petrarch, Boccaccio, Giotto, Michelangelo, Da Vinci, Raphael, Titian.

1295. Model Parliament called.

1297. Fall of Acre; end of Crusades.

1302. Battle of Courtrai; Flemish townsmen defeat French knights.

1347-1437. Emperors of Luxemburg-Bohemian line.

1314. Edward II defeated at Bannockburn by Scots under Bruce.

1331-55. Stephen Dushan rules an extended Serbian Empire.

1305-77. "Babylonian captivity of Popes" (papal residence at Avignon, France).

1348. Black Death appears in Florence and spreads over Europe.

1327-77. Edward III.

1354. Ottoman Turks gain foothold in Europe (Gallipoli).

1328. Philip VI (Valois) becomes king.

1356. Charles IV issues Golden Bull.

1337-1453. Hundred Years' War with France. English victories at Crécy (1346) and Poitiers (1356).

1364-80. Charles V (the Wise). Most of English possessions in France won back by Du Guesclin.

1377. Papacy returns from Avignon to Rome.

1381. Peasants' revolt led by John Ball and Wat Tyler.

1389. Serbs defeated by Turks in great battle at Kossovo.

1378-1417. Great Schism (two, later three, claim to be pope).

1399. Henry IV (Lancaster) overthrows Richard II.

1380. Venice crushes Genoa at Chioggia.

	FRANCE	GERMANY	ITALY AND PAPACY	GREAT BRITAIN	OTHER COUNTRIES
1400	<p>1415. Hundred Years' War renewed in reign of Charles VI (insane after 1392).</p> <p>1429-31. Joan of Arc saves France. (War ends in 1453; England loses all its possessions in France except Calais.)</p> <p>1461-83. Louis XI strengthens France.</p> <p>1477. Charles the Bold of Burgundy overthrown; his duchy annexed to France.</p> <p>1494. Charles VIII invades Italy (Italian wars begun).</p>	<p>1410-37. Sigismund emperor.</p> <p>1419-36. Hussite Wars. (Ziska blind leader against Germans.)</p> <p>1440-93. Frederick III (Hapsburg) emperor.</p> <p>1450. Gutenberg invents printing.</p> <p>1493-1519. Maximilian I emperor.</p>	<p>1414-18. Council of Constance; schism ended; John Huss burned as heretic (1415).</p> <p>1460-92. Lorenzo de Medici rules Florence.</p> <p>1494-98. Savonarola attempts reform in Florence.</p>	<p>1415. Henry V invades France (Agincourt, 1415).</p> <p>1450. Jack Cade's rebellion.</p> <p>1455-85. Wars of the Roses (Houses of York and Lancaster claim crown).</p> <p>1485. Henry VII (Tudor) defeats Richard III (York) at Bosworth and ends war. Strong monarchy established.</p> <p>1509-47. Henry VIII; separation of English Church from Rome.</p> <p>1547-53. Edward VI.</p> <p>1553-58. Queen Mary restores Catholic Church.</p> <p>1558-1603. Elizabeth establishes Church of England. Growth of sea power; industrial development. Elizabethan period of literature (Shakespeare).</p> <p>1588. Spanish Armada destroyed.</p>	<p>1453. Turks take Constantinople; end of Eastern Empire.</p> <p>1492. Columbus discovers America.</p> <p>1492. Conquest of Granada; Moors expelled from Spain.</p> <p>1497-98. Vasco da Gama reaches India by sea.</p>
1500	<p>1515-47. Francis I; wars with Charles V over Milan; Renaissance encouraged in France.</p> <p>1562. Huguenot Wars begun (St. Bartholomew's Massacre, 1572).</p> <p>1589-1610. Henry IV (Bourbon). Edict of Nantes ends Huguenot wars (1598).</p>	<p>1517. Luther begins Protestant Reformation; Diet of Worms condemns Luther (1521).</p> <p>1519-56. Charles V rules Spain, Germany, Netherlands, parts of Italy and America. Opposes Luther; wars against Turks (1526-32); abdicates (1555-56).</p> <p>1555. Religious peace of Augsburg (toleration of Lutherans).</p> <p>1556-64. Ferdinand I.</p> <p>1563. Council of Trent ends (beginning of Catholic recovery).</p>	<p>1503-13. Pope Julius II (Italian wars; patron of Michelangelo and Raphael).</p> <p>1508. League of Cambrai (Pope, Austria, France, and Spain) against Venice.</p> <p>1513-21. Pope Leo X (Medici) patron of arts and letters.</p> <p>1542. Pope Paul III establishes the Inquisition in Rome.</p> <p>1571. League of Papacy, Spain and Venice against Turks (Battle of Lepanto, 1572).</p>	<p>1599-47. Henry VIII; separation of English Church from Rome.</p> <p>1547-53. Edward VI.</p> <p>1553-58. Queen Mary restores Catholic Church.</p> <p>1558-1603. Elizabeth establishes Church of England. Growth of sea power; industrial development. Elizabethan period of literature (Shakespeare).</p> <p>1588. Spanish Armada destroyed.</p>	<p>1518. Zwingli begins Reformation in Switzerland.</p> <p>1519-1522. Magellan circumnavigates the globe.</p> <p>1536. Calvin begins Reformation at Geneva.</p> <p>1540. Jesuit order founded by Loyola.</p> <p>1556-98. Philip II succeeds his father Charles V in Spain, Italy, Netherlands, and the New World.</p> <p>1568. Revolt of Netherlands against Spain; siege of Leyden (1574); Union of Utrecht (1579); declaration of independence by the Dutch (1581).</p>
1600	<p>1610-43. Louis XIII; political power of the Huguenots crushed. (Richelieu chief minister of the crown.)</p> <p>1643-1715. Louis XIV; numerous wars of conquest; extravagant court at Versailles; brilliant period of French literature.</p> <p>1685. Edict of Nantes revoked and toleration of Huguenots ended.</p>	<p>1618-48. Thirty Years' War. Imperialist (Catholic) generals, Tilly and Wallenstein; Gustavus Adolphus, Protestant king of Sweden, victorious at Leipzig (1631); Lützen (1632); Peace of Westphalia (1648).</p> <p>1640-88. Growth of Prussia under the Great Elector.</p> <p>1683. Vienna besieged for last time by Turks; rescued by King John Sobieski of Poland.</p>	<p>1629. War over Mantua between Spain (which possessed Milan) and Austria.</p> <p>1684. Venice joins Austria and Poland in attack on Turks; makes conquests in Morea.</p>	<p>1603-25. James I (Stuart); personal union of England and Scotland.</p> <p>1607. Virginia colony founded (Jamestown).</p> <p>1620. Plymouth colony settled (Boston, 1630) by Puritans fleeing persecution in England.</p> <p>1642-49. Civil war between Crown and Parliament; Marston Moor (1644); Naseby (1645). Charles I executed (1649). England a commonwealth.</p> <p>1653-58. Cromwell rules England, Scotland, and Ireland as Lord Protector.</p> <p>1660. Stuart restoration under Charles II.</p> <p>1688. "Glorious Revolution" expels James II and seats William and Mary; Protestant succession established.</p>	<p>1611-32. Gustavus Adolphus king of Sweden.</p> <p>1644. Manchu rule begins in China.</p> <p>1648. Spain recognizes independence of the Dutch Netherlands.</p>
1700	<p>1701-13. War of the Spanish Succession. Treaty of Utrecht seats French prince (Philip V) on Spanish throne.</p> <p>1715-74. Louis XV; debauchery at court; France aids Prussia in Austrian Succession War.</p> <p>1756-63. Seven Years' War; France aids Austria against Prussia, loses Canada and India to British.</p> <p>1774-92. Louis XVI (Marie Antoinette of Austria, queen); reform measures defeated.</p> <p>1789-95. French Revolution. Estates-General becomes National Assembly (1789); constitution accepted by king (1791); kingship abolished (1792); Louis XVI executed (1793); Reign of Terror (1793-94); Directory established (1795).</p> <p>1796-99. Rise of Napoleon Bonaparte to be First Consul.</p>	<p>1701. Elector of Brandenburg receives title of King of Prussia.</p> <p>1701-13. Austria takes part in War of Spanish Succession.</p> <p>1713-40. Frederick William I develops Prussian army.</p> <p>1740-80. Maria Theresa queen of Bohemia and Hungary, archduchess of Austria; War of Austrian Succession (1740-48).</p> <p>1740-86. Frederick II (The Great) seizes Silesia from Austria and retains it in Seven Years' War (Battles of Rossbach and Leuthen, 1757); builds up Prussia in peace time.</p> <p>1763-90. Joseph II emperor; attempts reforms in Hapsburg lands.</p> <p>1790-92. Leopold II emperor.</p>	<p>1714. Milan, Naples, etc., given to Austria by treaty.</p> <p>1715. Turks drive Venetians from the Morea and Crete.</p> <p>1735. Spanish Bourbons established in Naples.</p> <p>1738. Tuscany given to Francis of Lorraine (husband of Maria Theresa).</p> <p>1796. Napoleon invades Italy; siege of Mantua.</p> <p>1797. Cisalpine Republic set up by Bonaparte.</p>	<p>1701-13. England takes part in War of Spanish Succession (Blenheim, 1704).</p> <p>1702-14. Anne queen.</p> <p>1714. George I (Hanover) becomes king; growth of cabinet government.</p> <p>1741-48. England aids Austria in Austrian Succession War.</p> <p>1745. Jacobite rebellion (Stuart supporters).</p> <p>1756-63. Seven Years' War; England aids Prussia; Canada acquired; supremacy established in India; British Empire founded.</p> <p>1764. Industrial Revolution begun; Hargreaves invents spinning jenny.</p> <p>1775-83. Revolt of the American colonies.</p> <p>1788. British colonization of Australia begun.</p>	<p>1709. Battle of Pultowa; forces of Charles XII crushed by Russia.</p> <p>1763-96. Catherine II empress of Russia.</p> <p>1772-95. Poland partitioned among Russia, Prussia, and Austria.</p>

WARS OF THE FRENCH REVOLUTION AND BONAPARTE—1792-1815

1796. Bonaparte's Italian Campaign.	1806. Prussia crushed at Jena.	1812. Napoleon invades Russia; sack of Moscow; retreats with heavy losses.
1798. Egyptian expedition fails (Battle of the Nile).	1807. Napoleon defeats Austrians at Wagram and Russians at Friedland.	1813. Napoleon defeated in three-day battle at Leipzig.
1800. Napoleon's victory at Marengo.	1807. Peace of Tilsit; hard terms for Prussia. Alexander I of Russia becomes Napoleon's ally.	1815. Wellington victorious at Waterloo.
1805. Nelson victorious at Trafalgar.		1815. Treaty of Vienna.
1805. Bonaparte wins at Austerlitz.		

FRANCE	GERMANY	AUSTRIA-HUNGARY	ITALY
<p>1804. Napoleon made emperor.</p> <p>1814. Napoleon abdicates; returns from Elba (1815); exiled (1815).</p> <p>1814. Bourbons restored under Louis XVIII.</p> <p>1824-30. Charles X; reactionary policy.</p> <p>1830. French begin occupation of Algeria.</p> <p>1830. July Revolution; Charles X abdicates; Louis Philippe becomes king ("citizen king").</p> <p>1848. February Revolution; Louis Philippe abdicates; republic proclaimed.</p> <p>1848-52. Second Republic (Louis Napoleon, president).</p> <p>1851. Coup d'état of Louis Napoleon; proclaimed emperor (Napoleon III, 1852-70).</p> <p>1854-56. Crimean War.</p> <p>1859. War with Austria in behalf of Italy.</p> <p>1861-67. Attempt to found a monarchy in Mexico fails (Maximilian).</p> <p>1870-71. Franco-Prussian War; France loses Alsace-Lorraine.</p> <p>1870. Third French Republic proclaimed.</p> <p>1875. Republican constitution adopted.</p> <p>1881. Tunis occupied; complications with Italy, Spain, and England.</p> <p>1891. Dual Alliance of France and Russia.</p> <p>1894-1906. Trials of Dreyfus for treason center of political scandal.</p> <p>1896. Annexation of Madagascar.</p>	<p>1806. Confederation of the Rhine formed by Napoleon.</p> <p>1806. Holy Roman Empire dissolved.</p> <p>1819. Karlsbad decrees passed by German Diet suppress liberalism.</p> <p>1834. German Customs Union (Zollverein) formed, a first step toward unity.</p> <p>1840-61. Frederick William IV king of Prussia.</p> <p>1848. Liberal uprisings in Prussia and other German states.</p> <p>1848-49. Frankfurt Parliament to unite Germany fails.</p> <p>1861-68. William I king of Prussia.</p> <p>1862. Bismarck becomes chief minister.</p> <p>1864. Schleswig and Holstein taken from Denmark by Prussia and Austria.</p> <p>1866. Austro-Prussian War over Holstein.</p> <p>1867-71. North German Confederation under Prussian leadership.</p> <p>1870-71. Franco-Prussian War.</p> <p>1871. German Empire proclaimed; William I emperor; Bismarck chancellor (1871-90).</p> <p>1882. Triple Alliance with Austria and Italy.</p> <p>1884. Germany begins African colonization.</p> <p>1888-1918. William II emperor.</p> <p>1897. Germany seizes Kiaochow.</p> <p>1899. Germany obtains Bagdad railway concession from Turkey.</p>	<p>1806. Holy Roman Empire dissolved; Francis II becomes Francis I of Austria.</p> <p>1809. Metternich becomes minister of foreign affairs; reactionary leader of Europe (1815-48).</p> <p>1815. Congress of Vienna; treaty of Vienna signed; "Holy Alliance" formed by Russia, Prussia and Austria.</p> <p>1835-48. Ferdinand I; reactionary rule.</p> <p>1848. Revolution expels Metternich; liberal gains short-lived. Francis Joseph I begins long reign.</p> <p>1849. Hungarian war for independence fails (Kossuth).</p> <p>1859. War with France and Italy (Battles of Magenta and Solferino). Austria loses Lombardy.</p> <p>1866. War with Prussia (Sadowa). Austria withdraws from German Confederation and loses Venetia.</p> <p>1867. Dual Monarchy of Austria-Hungary established.</p> <p>1876-90. Count Tisza, liberal leader, pursues policy of "Magyarization" in Hungary; economic development.</p> <p>1882. Triple Alliance formed by Austria, Germany, and Italy.</p>	<p>1815. Italy a group of small states under Austrian domination.</p> <p>1820. Revolt in Naples put down.</p> <p>1821. Revolt in Sardinia-Piedmont fails.</p> <p>1830. Revolution fails.</p> <p>1848. Revolution headed by Sardinia-Piedmont crushed.</p> <p>1849. Victor Emmanuel II becomes king of Sardinia-Piedmont. Cavour premier (1852-61).</p> <p>1859. War with Austria; Austrian control broken.</p> <p>1860-61. Garibaldi conquers and unites Italy (except Rome) under Victor Emmanuel; kingdom of Italy proclaimed.</p> <p>1870. Rome taken from pope and made capital.</p> <p>1878-1900. Humbert I.</p> <p>1882. Triple Alliance with Austria and Germany.</p> <p>1896. War with Abyssinia; Italians defeated at Adowa.</p>
<p>1904. Entente Cordiale between France and Great Britain settles disputes over colonies.</p> <p>1905. Separation of Church and State.</p> <p>1905-06. Extension of French influence in Morocco challenged by Germany; Algeiras Conference upholds French policy.</p> <p>1911. War with Germany narrowly averted over Moroccan question. France establishes protectorate there; Germany given economic opportunities and part of French Equatorial Africa.</p>	<p>1900. Great naval development begins.</p> <p>1905-06. First Moroccan incident.</p> <p>1908. Germany upholds Austria in Bosnia affair.</p> <p>1911. Second Moroccan incident.</p> <p>1911. Enormous growth of Germany in population, industry, and trade.</p> <p>1911-13. German standing army increased from 515,000 to 866,000 men.</p> <p>1912. Socialists elect 110 of 397 members of Reichstag.</p>	<p>1905-13. Struggle in Hungary over electoral reform; Magyars retain political control.</p> <p>1907-12. Reform measures in Austria blocked by racial quarrels.</p> <p>1908. Austria annexes Bosnia and Herzegovina; blow to Serbian nationalist movement.</p> <p>1914. Archduke Francis Ferdinand, heir to Austrian throne, assassinated in Bosnia by Serbian subjects.</p>	<p>1900. Victor Emmanuel III becomes king.</p> <p>1911-12. War with Turkey; Italy takes Tripoli from Turkey.</p> <p>1912. Universal suffrage introduced.</p>

FIRST WORLD WAR—see Chart III

1919. Treaty of Versailles ratified. By this and subsequent peace treaties France obtains Alsace-Lorraine, parts of Cameroon and Togo (in Africa), mandate over Syria, etc., also economic reparations. 1920. Clemenceau resigns as premier. 1920. French troops occupy Frankfurt but withdraw upon protest of British. 1920. Chamber of Deputies votes to resume diplomatic relations with Vatican. 1920. Millerand elected president. 1921. Briand appointed premier and minister of foreign affairs. 1922. Poincaré premier; declares policy of insisting on all France's rights under the treaty of Versailles. 1923. French troops seize the Ruhr. 1925. Painlevé premier; Caillaux as finance minister fails to settle American debt. 1926. Herriot and Poincaré premiers; 15 changes of ministry since 1920. 1928. Finances stabilized; franc devalued to one-fifth of prewar value. 1932. Briand dies. President Doumer assassinated; succeeded by Lebrun. 1934. Stavisky scandal brings Radical Socialist régime to end. 1936. Léon Blum forms first Socialist ministry; many strikes; franc again devalued. 1937. Chautemps premier; gold standard abandoned. 1938. Daladier premier; abandons Czechoslovakia by accepting Munich Pact. 1939. Guarantees independence of Poland, Rumania, Greece, Turkey; with Great Britain declares war on Germany over invasion of Poland. 1940. Reynaud premier. Crushing defeat in June forces request for peace with Germany and Italy. Government reorganized as authoritarian republic under Pétain. 1942. Nazis put Laval in power. Collaboration with Germany. Nazis occupy all France in November.	1918. German Revolution; William II abdicates. 1919. June 28. Treaty of Versailles signed (ratified July 10); Germany loses overseas colonies, Alsace-Lorraine, parts of Posen and West Prussia, etc. 1919. "Spartan" revolt suppressed. 1919. Republican constitution adopted. 1920. Upper Schleswig votes for union with Denmark. 1920. Kapp counterrevolt fails. 1921. Upper Silesia plebiscite returns majority for German union. 1923. Ruhr occupied by French and Belgian troops. 1924. Dawes Plan for reparations payments accepted. 1925. President Ebert dies. Hindenburg elected. 1926. Germany admitted to League of Nations. 1930. French troops leave Rhineland. 1932. Hindenburg re-elected. Reparations ended. 1933. Nazi Revolution. "Third Reich" under Chancellor Hitler; Germany leaves League. 1934. Hindenburg dies. Hitler takes presidential powers. 1935. Saar rejoins Germany; compulsory military service. 1936. Rhineland reoccupied by army; Italy and Japan join alliance against communism. 1937. Supports revolt of Spanish fascists. 1938. Annexes Austria; by Munich Pact forces Czechoslovakia to cede Sudeten area. 1939. Absorbs Czechoslovakia; signs nonaggression pact with Russia; invades Poland; war with England and France. 1941. Invades Russia. 1943. Driven from North Africa by Allies.	CZECHOSLOVAKIA 1920. Constitution adopted. 1920. Joins Yugoslavia and Rumania in Little Entente. 1924. Signs treaty of alliance with France. 1927. President Masaryk re-elected for seven-year term. 1929. Leases port of Hamburg for 99 years. 1933. Signs pact with Rumania and Yugoslavia for closer cooperation. 1935. Masaryk retires; Benes president. 1937. Masaryk dies. 1938. Loses nearly one-third of its area to Germany, Poland, and Hungary. 1939. Absorbed by Germany; ceases to exist as a nation.	HUNGARY 1919. Mar.-Aug. Soviet régime overthrown with Rumanian aid. 1920. Treaty of Trianon; Hungary loses territory to Czechoslovakia, Italy, etc. 1920. Monarchy again declared; Admiral Horthy regent. 1921. Charles I exiled after attempt to regain throne; dies 1922. 1924-26. Finances stabilized under League of Nations. 1938. Annexes about 4,875 miles of Czechoslovak territory. 1939. Joins anti-Comintern pact. 1940. Regains northern Transylvania. 1941. Joins Germany in war against Russia.	AUSTRIA 1919. Treaty of St. Germain reduces Austria to small area about Vienna. 1921. Various districts vote for union with Germany. 1922-26. Finances stabilized under direction of League of Nations. 1927. Socialist riots in Vienna. 1933. Chancellor Dollfuss sets up semi-fascist régime. 1934. Dollfuss assassinated by Nazis. 1936. Schuschnigg dictatorship. 1938. Hitler forces Schuschnigg to resign; new government invites Germany to restore order. 1939. Austria becomes a German state; ceases to exist as a nation.	1919. Treaty of St. Germain; Italy gains Trentino, etc. 1919-20. D'Annunzio holds Fiume. 1920. Treaty of Rapallo with Yugoslavia secures Istria and Gorizia; Fiume free state. 1922. Fascists get control of government by a "bloodless revolution"; Mussolini, their leader, becomes prime minister. 1924. Treaty with Yugoslavia. Fiume annexed; harbor with that of Porto Barro under joint control. 1926. Powers of premier and central government greatly increased; municipal home rule abolished. 1927. Government cuts prices and wages; forbids strikes and lockouts. 1928. Fascist Grand Council made supreme power. 1929. Italy ends quarrel with pope; Vatican State established. 1934. Mussolini announces "corporate state." 1936. Ethiopia annexed. 1937. Supports insurgents in Spain; forms alliance with Germany. 1938. Supports Germany in Czech crisis. 1939. Annexes Albania. 1940. Declares war on England and France; invades Greece. 1942-43. Loses African colonies to Allies.
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GREAT BRITAIN	RUSSIA	TURKEY AND THE BALKANS	OTHER COUNTRIES AND GENERAL PROGRESS
<p>1801. Irish Parliament abolished; Irish members seated in British Parliament. United Kingdom of Great Britain and Ireland.</p> <p>1806. Cape Colony conquered; beginning of British in South Africa.</p> <p>1807. Abolition of slave trade.</p> <p>1812-15. War with the United States; Treaty of Ghent (1814).</p> <p>1820-30. George IV king.</p> <p>1830-37. William IV king.</p> <p>1832. Reform Bill; political power to middle classes. Other legislation abolishing slavery, reforming labor conditions, etc.</p> <p>1837. Victoria begins her long reign (1837-1901).</p> <p>1846. Repeal of corn laws; free trade established.</p> <p>1854-56. Crimean War with Russia.</p> <p>1857. Indian Mutiny; British government assumes rule of India (1858).</p> <p>1867. Second parliamentary reform act; political power extended to workingmen; beginning of democratic rule.</p> <p>1868-74. First ministry of Gladstone (Liberal); "Great Ministry."</p> <p>1870. Beginning of Home Rule agitation.</p> <p>1874-80. Disraeli ministry (Conservative).</p> <p>1882. British occupy Egypt.</p> <p>1887. First Colonial Conference.</p> <p>1899-1902. Boer War. Union of South Africa formed (1909).</p> <p>1901-10. Edward VII king.</p> <p>1901. Commonwealth of Australia formed.</p> <p>1903. Irish land purchase act passed.</p> <p>1907. Anglo-Russian agreement settles differences over Persia.</p> <p>1908-1916. Asquith prime minister (Liberal).</p> <p>1910-36. George V king.</p> <p>1911. Power of House of Lords limited.</p> <p>1914. Irish Home Rule Bill passed; suspended.</p> <p>1914. Bill passed for disestablishing Anglican Church of Wales; suspended.</p>	<p>1801-25. Alexander I emperor.</p> <p>1809. Russia gains Finland after war with Sweden (1807-09).</p> <p>1815. Czar grants a constitution to Poland.</p> <p>1825-55. Nicholas I emperor.</p> <p>1828-29. Russia wages war against Turkey in behalf of Greece.</p> <p>1830-32. Revolution in Poland fails; Poland made a Russian province.</p> <p>1854-56. Crimean War; western powers against Russia (siege of Sevastopol, 1854-55). Peace of Paris formulates rules for naval warfare (1856).</p> <p>1855-81. Alexander II emperor.</p> <p>1861. Czar frees Russian serfs.</p> <p>1863. Polish insurrection suppressed.</p> <p>1877-78. Russo-Turkish War.</p> <p>1881. Alexander II assassinated.</p> <p>1881-94. Alexander III pursues strong reactionary policy. Persecution of Jews begins.</p> <p>1891. Dual Alliance with France.</p> <p>1894-1917. Nicholas II exercises absolutism; suppression of intellectual progress.</p> <p>1899. Finnish constitution abrogated.</p> <p>1902. Trans-Siberian railroad opened.</p> <p>1904-05. Russo-Japanese War.</p> <p>1905. Russian Revolution begins; first Duma meets (1906).</p> <p>1907. Anglo-Russian agreement made.</p>	<p>1821-29. War for Greek independence (Philhellenic movement; Lord Byron). Greece gains independence (1829).</p> <p>1828-29. Russo-Turkish War (Treaty of Adrianople; Greek independence acknowledged; Moldavia and Wallachia partially independent).</p> <p>1830. Serbia secures autonomy after long struggle.</p> <p>1833-62. Otto I (House of Bavaria) king of Greece.</p> <p>1854-56. Crimean War. Western Powers aid Turkey against Russia.</p> <p>1866. Rumania formed as self-governing state by union of Moldavia and Wallachia (Charles I, 1866-1914).</p> <p>1877-78. Russo-Turkish War (siege of Plevna, 1877). Treaties of San Stefano and Berlin make Serbia, Montenegro, and Rumania independent; Bulgaria partly autonomous.</p> <p>1908-09. Successful revolution in Turkey by "Young Turks."</p> <p>1911-12. Turco-Italian War.</p> <p>1912-13. Balkan Wars; Balkan allies conquer most of Turkey in Europe; fight over new boundaries.</p>	<p>Industrial Revolution. The application of steam power opens new era.</p> <p>1807. Steamboat service established by Fulton.</p> <p>1812. Uprising in Spain against Napoleon; adoption of liberal constitution. Liberalism later suppressed by Ferdinand VII (1814-33).</p> <p>1820. Revolutions in Italy and Spain crushed by European Alliance (1821-23).</p> <p>1830. Independent monarchy established in Belgium (Leopold I, 1833-65).</p> <p>1830. Manchester and Liverpool railroad opened; Baltimore and Ohio railroad begun.</p> <p>1837. Patent granted to S. F. B. Morse for electromagnetic telegraph.</p> <p>1840. China opened to foreigners.</p> <p>1854. Japanese ports opened to foreigners.</p> <p>1858. Transatlantic telegraph cable laid.</p> <p>1859. Publication of Charles Darwin's 'Origin of Species' setting forth doctrine of evolution.</p> <p>1864. Beginning of International Red Cross.</p> <p>1869. Suez Canal opened.</p> <p>1884. Partition of Africa among European powers.</p> <p>1885. Congo Free State formed, Leopold I of Belgium king; made Belgian colony (1908).</p> <p>1894-95. War between China and Japan. Expansion of Japan begins.</p> <p>1899. First Hague Peace Conference. Establishment of Court of International Arbitration.</p> <p>1899. Wireless telegraphy established between France and England by Marconi.</p> <p>1900. Boxer uprising against foreigners in China.</p> <p>1903. First airplane flight, by Wright brothers.</p> <p>1905. Union of Sweden and Norway dissolved.</p> <p>1907. Nineteen women elected to Finnish Diet, first women members in a national legislature.</p> <p>1907. Second Peace Conference at The Hague.</p> <p>1909. Commander Peary reaches North Pole.</p> <p>1910. Portugal becomes republic.</p> <p>1911. Capt. Roald Amundsen reaches South Pole.</p> <p>1912. Republic proclaimed in China.</p> <p>1914. Panama Canal opened to traffic by U. S.</p>

F I R S T W O R L D W A R — s e e C h a r t I I I

	POLAND			
<p>1916. Sinn Fein revolt in Ireland crushed; Sir Roger Casement executed.</p> <p>1916. Lloyd George becomes premier (Coalition Cabinet).</p> <p>1918. Suffrage extended to women.</p> <p>1918. Labor party secures 75 seats in Parliament at general elections.</p> <p>1919. Anglo-Persian agreement puts Persia under British influence.</p> <p>1919. Irish declare independence; movement for republic checked by military measures; rioting and disorder follow.</p> <p>1919. Great Britain obtains mandates over much former German territory.</p> <p>1920. New Home Rule Bill passed.</p> <p>1920. Labor unrest leads to adoption of liberal government labor program.</p> <p>1922. Irish Free State inaugurated.</p> <p>1922. Coalition government falls; Bonar Law (Unionist) premier.</p> <p>1923. Stanley Baldwin (Conservative) becomes prime minister.</p> <p>1924. First Labor government; Ramsay MacDonald (Socialist) premier.</p> <p>1929. MacDonald again premier.</p> <p>1931. MacDonald heads coalition government after Labor party falls; drops gold standard, adopts tariff.</p> <p>1935. Baldwin premier; new constitution for India.</p> <p>1936. George V dies; Edward VIII abdicates after 11 months; George VI king.</p> <p>1937. Neville Chamberlain premier; conciliates dictator countries.</p> <p>1938. Accepts Munich Pact.</p> <p>1939. Guarantees independence of Poland, Greece, Rumania, Turkey; with France, declares war on Germany over invasion of Poland.</p> <p>1940. Churchill premier; continues struggle after fall of France.</p>	<p>1917. Poles organize army and join Allies.</p> <p>1918. Republic of Poland proclaimed.</p> <p>1919. Treaty of Versailles recognizes Polish independence and restores German, Austrian, and part of Russian Poland.</p> <p>1921. Treaty of peace with Russia.</p> <p>1921. Constitution adopted.</p> <p>1922. President Narutowicz assassinated.</p> <p>1926. Marshal Pilsudski becomes virtual dictator.</p> <p>1934. New constitution adopted.</p> <p>1935. Pilsudski dies.</p> <p>1936. Smigly-Rydz dictator.</p> <p>1938. Annexes Teschen area.</p> <p>1939. Independence guaranteed by England and France; refuses German demands; invaded and partitioned by Germany and Russia; ceases to exist as a nation.</p>	<p>1917. Mar. 15. Revolution; Nicholas II abdicates; Kerensky becomes dictator. Republic proclaimed, Sept. 17.</p> <p>1917. Nov. Bolshevik government succeeds Kerensky regime.</p> <p>1918. Mar. 3. Peace of Brest-Litovsk signed with Germany.</p> <p>1917-18. Several Russian provinces establish independence: Finland, Ukraine, Estonia, Lithuania, Latvia.</p> <p>1921. Russo-Polish treaty. Russia retains White Russia.</p> <p>1922. Far Eastern Republic (Siberia) joins Soviet Republic.</p> <p>1924. Lenin dies.</p> <p>1928. Trotsky banished for opposition to Stalin.</p> <p>1928-32. Industry and agriculture reorganized under Five-Year Plan.</p> <p>1933. Diplomatic recognition by United States.</p> <p>1934. Admitted to League of Nations.</p> <p>1936. New constitution.</p> <p>1937. Aids Spanish loyalists.</p> <p>1938. Stalin "purges" opposition.</p> <p>1939. Signs nonaggression pact with Germany; partitions Poland with Germany; invades Finland.</p> <p>1940. Defeats Finland, absorbs Baltic States, Rumanian territory.</p> <p>1941. Invaded by Germany.</p>	<p>1917. Greece joins Allies after abdication of Constantine I.</p> <p>1918. Kingdom of Serbs, Croats, and Slovenes (Yugoslavia) proclaimed.</p> <p>1919-20. Greece obtains Thrace, Smyrna, etc., by treaties of Neuilly and Sèvres. Turkey loses half her population and two-thirds of her territory.</p> <p>1920. Alexander dies; Constantine recalled to Greece.</p> <p>1922. Turkish Nationalists sweep Greek forces out of Asia Minor and force allies to restore Eastern Thrace; dethrone Sultan and decree end of Ottoman Empire.</p> <p>1922. King Constantine of Greece forced to abdicate; Prince George succeeds to throne.</p> <p>1923. Treaty of Lausanne revises peace in Near East.</p> <p>1924. King George of Greece deposed; republic proclaimed.</p> <p>1924. Turkey adopts republican constitution; ends califate.</p> <p>1929. King Alexander establishes dictatorship in Yugoslavia.</p> <p>1930. Prince Carol takes throne of Rumania from his son Michael.</p> <p>1934. Army leaders set up military dictatorship in Bulgaria.</p> <p>1934. King Alexander of Yugoslavia assassinated.</p> <p>1935. Royalists seize power in Greece; restore monarchy.</p> <p>1936. Turkey refortifies Dardanelles.</p> <p>1939. Albania annexed by Italy.</p> <p>1940. Rumania occupied by Germany; Greece invaded by Italy.</p> <p>1941. Germany occupies Bulgaria, conquers Greece and Yugoslavia.</p>	<p>1919. International Labor Conference in Washington.</p> <p>1920. Rumania obtains Bessarabia by treaty with Great Powers.</p> <p>1920. Armenia overrun by Bolsheviks and Turks. President Wilson appoints a mediator.</p> <p>1920. League of Nations established; first meeting of Council in Paris, Jan. 16; Assembly meets in Geneva, Nov. 15.</p> <p>1920. Danzig and Saar Valley put under administration of League of Nations.</p> <p>1921. Limitation of Armament Conference at Washington.</p> <p>1922. Japanese forces evacuate Siberia.</p> <p>1922. British end protectorate over Egypt.</p> <p>1922. Permanent Court of International Justice opened at The Hague.</p> <p>1924. Pictures sent over wire and by radio.</p> <p>1925. Reza Khan becomes Shah of Persia.</p> <p>1927. Radio-telephone service opened between England and United States.</p> <p>1927. First motion pictures sent by radio ("television").</p> <p>1927. Col. Charles A. Lindbergh makes first non-stop flight from New York to Paris.</p> <p>1928. Many nations sign Kellogg-Briand pact.</p> <p>1929. Graf Zeppelin flies around the world.</p> <p>1931. Spain becomes republic; Alfonso flees.</p> <p>1931-32. Japan sets up new state of Manchukuo.</p> <p>1933. Japan announces withdrawal from League.</p> <p>1934. Leopold III succeeds his father, Albert I, as king of the Belgians.</p> <p>1935. Transpacific air route established.</p> <p>1935. League sanctions against Italy fail.</p> <p>1936. Japan extends authority in N. China.</p> <p>1936-37. Civil war in Spain.</p> <p>1937. Experimental transatlantic airplane service starts; Russians make two flights over the North Pole to the United States.</p> <p>1937-38. War between China and Japan. Persia completes railroad from Persian Gulf to Black Sea. European countries prepare for war.</p> <p>1939. Victory of Spanish fascists ends civil war.</p> <p>1940. Western Hemisphere nations adopt Act of Havana for defensive cooperation.</p>

III. THE WORLD WAR AND THE PEACE SETTLEMENT—1914-19

PRELIMINARY EVENTS				
1914	<p>June 28. Archduke Ferdinand assassinated.</p> <p>July 23. Austria sends ultimatum to Serbia; conciliatory reply (July 25).</p> <p>July 27. Failure of conference proposed by England owing to refusal of Germany.</p> <p>July 28. Austria declares war on Serbia.</p> <p>July 29. Russia mobilizes against Austria in aid of Serbia.</p>	<p>July 30. Belgrade bombarded. General mobilization in Russia begun.</p> <p>Aug. 1. Germany declares war on Russia over mobilization.</p> <p>Aug. 2. Germany demands passage through Belgium.</p> <p>Aug. 3. Germany declares war against France, Russia's ally.</p> <p>Aug. 4. Germans invade Belgium when passage is refused.</p> <p>Aug. 4. England declares war on Germany to protect Belgium.</p>		
	<p>WESTERN FRONT</p> <p>Sept. 6-10. German invasion of France stopped at the Marne. Entrenched line established along the Aisne, north to Belgian coast, and southeast to Switzerland.</p> <p>Oct.-Nov. Germans fail to break line in Flanders (Ypres).</p>	<p>EASTERN FRONT</p> <p>Aug. 26-31. Hindenburg stops Russian offensive at Mazurian Lakes (Battle of Tannenberg).</p> <p>Aug.-May, 1915. Russians invade Galicia and capture Carpathian passes.</p> <p>Nov.-Dec. Three German attacks on Warsaw beaten off.</p>	<p>OTHER FRONTS AND EVENTS</p> <p>Aug. 24. Naval battle at Helgoland; German navy bottled up.</p> <p>Aug.-Sept. Germany loses overseas colonies—in Africa to the British, Pacific Islands to British and Japanese.</p> <p>Aug.-Sept. Austrian invasions of Serbia fail.</p> <p>Nov. 6. Japanese take Tsingtau (Kiaochow) in Shantung, China, from Germans.</p> <p>Nov. 10. German cruiser Emden destroyed at Cocos Islands.</p>	<p>DIPLOMATIC EVENTS</p> <p>Aug. 7. Montenegro joins the Allies.</p> <p>Aug. 23. Japan joins the Allies.</p> <p>Oct. 29. Turkey openly joins Germany and Austria.</p>
1915	<p>Repeated attempts to break the line by Allies at Neuve-Chapelle (Mar. 10); Germans at Ypres (Apr.-May); Allies above Arras (May-June); Germans in the Argonne (July); Allies in Champagne and Artols (Sept.-Oct.).</p>	<p>May-Sept. "Mackensen's drive" expels Russians from Galicia.</p> <p>June-Oct. Austro-German drive into Russian Poland; capture of Warsaw (Aug. 5); Brest-Litovsk (Aug. 25); Vilna (Sept. 18).</p>	<p>Feb.-Dec. Anglo-French attacks on the Dardanelles fail.</p> <p>May 7. Lusitania sunk; 1,198 lives lost.</p> <p>July. German Southwest Africa conquered by General Botha.</p> <p>Oct.-Dec. Austro-German army conquers Serbia; Allied expedition from Saloniki defeated at Vardar (Dec. 3-12).</p> <p>Dec.-Jan. Gallipoli expedition abandoned by Allies after enormous losses.</p>	<p>May. 23. Italy declares war on Austria.</p> <p>Oct. 13. Bulgaria joins Teutonic allies.</p>
1916	<p>Feb.-July. Terrific German attacks on Verdun fail ("They shall not pass").</p> <p>July-Nov. Allied gains in Battle of the Somme.</p>	<p>June-Aug. Russian counter-attack on Galicia; penetrates to Halicz.</p> <p>Aug.-Dec. Rumania invades Transylvania; terrific counter-attack of German-Austrian-Bulgarian armies (Mackensen); Bucharest taken and Rumania crushed.</p>	<p>Jan.-Feb. Austro-Bulgarian invasion of Montenegro and Albania.</p> <p>Jan.-July. Russian drive through the Caucasus.</p> <p>Apr. 25-28. Sinn Fein rebellion in Ireland crushed; Sir Roger Casement executed.</p> <p>Apr. 29. Capture of British forces at Kut-el-Amara.</p> <p>May-June. Austrian offensive against Italy.</p> <p>May 31. Naval battle of Jutland; German fleet withdraws.</p> <p>Aug. 4. Italian counter-offensive begun; gains in the Trentino; Gorizia captured (Aug. 9).</p>	<p>Mar. 9. Portugal joins the Allies.</p> <p>Aug. 27. Rumania joins the Allies.</p> <p>Dec. 7. Lloyd George displaces Asquith as head of British Cabinet.</p>
1917	<p>Mar. Withdrawal of Germans to "Hindenburg line"; wasting of country on 50-mile front.</p> <p>Apr.-Dec. Repeated Allied attempts to break line at Arras (Apr.-June); Vimy Ridge taken (Apr. 9-12); along Aisne (Apr.-Nov.); in Flanders (July-Dec.); at Cambrai (Nov.-Dec.).</p>	<p>Mar. 15. Russian revolution destroys effectiveness of Russian army.</p> <p>July. Russian offensive on east front fails.</p> <p>Sept. 3. Riga captured by Germans.</p>	<p>Feb.-Oct. British Mesopotamia campaign; Kut-el-Amara recaptured (Feb. 24); Bagdad (Mar. 10).</p> <p>Oct.-Dec. Italian disaster at Caporetto; driven back from Isonzo to Piave.</p> <p>Oct.-Dec. Allenby's Palestine campaign; fall of Jerusalem (Dec. 10).</p>	<p>Jan. 31. Germany announces unrestricted submarine warfare.</p> <p>Feb. 3. United States severs diplomatic relations with Germany.</p> <p>Mar. 15. Czar of Russia dethroned; Kerensky establishes moderate government.</p> <p>Apr. 6. United States enters the war; Panama, Cuba, Liberia, Brazil follow; nine Central and South American states sever relations with Germany but do not declare war.</p> <p>June 12. King Constantine deposed and Greece joins Allies.</p> <p>Aug. 14. China joins the Allies.</p> <p>Nov. 8. Bolsheviks control government in Russia.</p>
1918	<p>Mar.-July. Great drive of Germans fails; Picardy offensive launched (Mar. 21); Lys River (Apr. 9); Aisne and Marne (May 27); Oise (June 9); second battle of the Marne (July 15).</p> <p>July 18. Allied counter-offensive begun: Second battle of the Somme (Aug. 8); Americans take St. Mihiel (Sept. 12); Germans lose Lys salient (Aug.-Sept.); Allied and American advance along Argonne-Meuse front (Sept.-Nov.); "Hindenburg line" broken (Oct.); German right flank turned in Belgium (Sept.-Nov.); and line of retreat threatened. Germans decide to surrender to avoid crushing defeat.</p>	<p>Feb.-Mar. Germany transports forces from Russian front for use on western front.</p> <p>Sept. Allies defeat Bulgarian armies in Macedonia, and Bulgaria sues for peace.</p> <p>Oct.-Nov. Montenegro and Serbia recovered by Allies.</p>	<p>Aug. 4. Allies seize Archangel, Russia, and establish a northern front.</p> <p>Aug. American-Japanese expedition to Siberia.</p> <p>Sept. 19-Oct. 26. Allenby clears Palestine of Turks; cuts Bagdad railroad. Turkey sues for peace.</p> <p>Oct. 24-25. New Italian attack drives Austrians back on line from Alps to Adriatic. Austria sues for peace (Oct. 29).</p> <p>Nov. 14. Surrender of German East Africa.</p>	<p>Jan. 5. Lloyd George announces war aims of the Allies.</p> <p>Jan. 8. President Wilson lays down "14 points."</p> <p>Jan.-Feb. Breakup of Russia; Finland, Lithuania, Ukraine, Crimea, Armenia, Siberia, etc., set up independent governments.</p> <p>Mar. 3. Soviet Russia concludes humiliating peace of Brest-Litovsk with Germany.</p> <p>June 30-Sept. Allies recognize independence of Czecho-Slovakia.</p> <p>Sept. 30. Bulgaria signs armistice.</p> <p>Oct. 5. Germany appeals to President Wilson for restoration of peace.</p> <p>Oct. 30. Turkey signs armistice.</p> <p>Oct. 31. Hungarian independence declared.</p> <p>Nov. 3. Austria signs armistice.</p> <p>Nov. 9. Polish republic announced.</p> <p>Nov. 10. German Emperor flees to Holland; signs abdication (Nov. 28).</p> <p>Nov. 11. Armistice signed by Germany.</p> <p>Nov. 12. Emperor Charles abdicates Austrian throne.</p> <p>Nov. Jugo-Slav convention proclaims Unitary Kingdom of Serbs, Croats, and Slovenes.</p>
THE PEACE SETTLEMENT				
1919	<p>Jan. 18. Peace Conference of 27 Allied and Associated Powers meets at Versailles. Treaties drawn up with five enemy nations.</p> <p>June 28. Treaty with Germany signed at Versailles; includes Covenant of the League of Nations. Germany loses her overseas colonies, Alsace-Lorraine, parts of Posen and West Prussia, and lesser European territories; armament reduced; reparations settlement undertaken. Ratified by all the Powers except the United States, whose Senate rejects the treaty on Nov. 19, 1919, and Mar. 19, 1920.</p> <p>Sept. 10. Treaty with Austria signed at St. Germain. Austria reduced from 115,000 to 32,000 square miles, and from 30,000,000 to 6,500,000 population, by territorial cessions to Czecho-Slovakia, Hungary, Poland, Rumania, Serbia, and Italy.</p> <p>Nov. 27. Treaty with Bulgaria signed at Neuilly. Bulgaria loses her conquests of the Balkan Wars of 1912-13 and of the World War to Rumania, Serbia, and Greece.</p>			
1920	<p>June 4. Treaty with Hungary signed at Trianon. Hungarian boundaries established with territorial concessions to Rumania, Jugo-Slavia, and other border states.</p> <p>Aug. 10. Treaty with Turkey signed at Sevres. Turkey loses half her population and two-thirds of her territory; the Straits internationalized; much of Asiatic Turkey distributed among the Powers as mandatories. (Not ratified by Turkey; replaced in 1923 by Treaty of Lausanne.)</p>			

IV. CANADIAN HISTORY

PERIOD OF DISCOVERY—1000-1500		OTHER COUNTRIES
1000	1000. Northmen discover America. 1497. John Cabot discovers Newfoundland.	
FRENCH RULE		
1500	1534. Cartier coasts along Newfoundland; explores the St. Lawrence (1535, 1540).	1515-47. Francis I king of France. 1539-43. De Soto's expedition in southern United States. 1555-64. Coligny attempts to found Huguenot colony in Florida.
1600	1604. Port Royal (Annapolis, Nova Scotia), first permanent French settlement, founded. 1608. Quebec settled by French colonists led by Champlain. 1610. Hudson discovers Hudson Bay while searching for the Northwest Passage; England claims Hudson Bay region. 1613. English colonists from Virginia capture Port Royal; Quebec captured by the British (1629); New France and Acadia restored to the French by the treaty of St. Germain (1632). 1615. Champlain explores Lake Huron. 1623-32. War between English and French. English attack Acadia (Nova Scotia); capture Quebec. Canada restored to France by treaty. 1627. St. Lawrence valley granted to Richelieu's company of "One Hundred Associates"; control New France (1627-63). 1642. Montreal founded by Maisonneuve as a religious colony. 1658-60. Groselliers and Radisson reach the Mississippi and Great Plains. 1663. Charter of the company of "One Hundred Associates" revoked; New France a royal colony. 1666. Allouez founds a mission on Lake Superior. 1670. Hudson's Bay Company founded in England to carry on trade in the new territory. 1672. Frontenac becomes governor of Canada. 1673. Marquette and Joliet discover the Mississippi. 1682. La Salle descends the Mississippi and takes the country for France. 1689-97. "King William's War"; Acadia captured by the British; attack on Quebec fails; conquest restored at the Peace of Ryswick (1697).	1607. Jamestown, Virginia, settled by English colonists. 1618-48. Thirty Years' War in Europe. 1620. Plymouth Colony founded by English Puritans. 1643-1715. Louis XIV king of France. 1688. William III of Orange ascends English throne. 1689-97. War of Louis XIV over succession in the Rhenish Palatinate. 1699. French settle in Louisiana.
1700	1701. Detroit founded as French post; Forts Frontenac and Duquesne, and other posts on the British frontier follow. 1701-13. "Queen Anne's War." Unsuccessful attack on Quebec; Acadia seized; France cedes Hudson Bay region, Newfoundland, and Acadia to Great Britain (Treaty of Utrecht, 1713). 1743. The Verendryes reach the foothills of the Rocky Mountains. 1744-48. "King George's War." Louisbourg captured by English colonists (1745); restored to French by treaty of Aix-la-Chapelle. 1749. English settlement of Halifax founded; colonization of Nova Scotia begins. 1755-63. "French and Indian War." French deported from Nova Scotia (1755); British under Wolfe capture Quebec (1759); New France ceded to England by Peace of Paris (1763).	1701-13. War of the Spanish Succession in Europe. 1702-14. Anne queen of England. 1727-1760. George II king of England. 1740-48. War of the Austrian Succession 1756-63. Seven Years' War in Europe. 1789-95. French Revolution. 1792-1815. Wars of the French Revolution and Napoleon.
ENGLISH PERIOD		
	1774. Quebec Act passed by British Parliament to organize government for Canada. 1775-83. American Revolution; Loyalists flee to Canada; colonists' attack on Quebec repulsed. 1791. Canada divided into Upper and Lower Provinces by the Constitutional Act passed by British Parliament; popular assemblies established with limited powers. 1793. Sir Alexander Mackenzie reaches the Pacific Ocean.	
1800	1812-15. War with the United States; American attempts to invade Canada repulsed; surrender of Detroit (1812); naval battle of Lake Erie (1813). 1812-20. Earl of Selkirk founds settlement in Red River Valley. 1837-38. Rebellions against officialdom; French Canadians led by Papineau attempt to found a republic in lower Canada; William L. Mackenzie heads armed rebellion in Upper Canada. 1838. Lord Durham sent out from England to determine conditions in Canada; famous report to colonial office leads to changes in Canadian policy. 1840. Act of Union joins the two provinces under a royal governor. 1842. Webster-Ashburton treaty between Great Britain and United States settles Maine boundary dispute. 1854. Reciprocity treaty with the United States; abrogated by United States (1866). 1858. Capital removed to Ottawa. 1864. Quebec Conference held to consider question of confederation.	1803. United States buys Louisiana territory from France. 1832. Parliamentary Reform Act passed by the British Parliament. 1837. Victoria ascends the British throne. 1846. Boundary between the United States and Canada settled at 49th parallel. 1861-65. Civil War in the United States.
DOMINION PERIOD		
	1867. British North America Act establishes the Dominion of Canada (Confederation of Ontario, Quebec, New Brunswick, Nova Scotia), with self-government. 1867. Conservative government organized by Sir John Macdonald (premier 1867-73, 1878-91). 1869. Hudson's Bay Company's land purchased by Canadian government. 1870. Rebellion of Red River half-breeds against extension of Dominion control over Manitoba; led by Louis Riel. Province of Manitoba formed. 1871. Treaty of Washington between Great Britain and the United States provides for the settlement of the Nova Scotia fisheries dispute and the Oregon boundary question. 1871. British Columbia joins the Union. 1872. Anti-Unionist agitation in Nova Scotia ended by defeat of the party in general elections. 1873. Prince Edward Island admitted to the Union. 1873. Conservative government overthrown because of Canadian Pacific Railroad scandal; Alexander Mackenzie forms Liberal government. 1878. Conservatives restored on protectionist platform. 1885. Riel leads half-breed rebellion in Saskatchewan to obtain squatter rights. 1885. Canadian Pacific Railroad finished. 1893. Bering Sea controversy with the United States settled. 1896. Conservatives defeated on question of reestablishment of Roman Catholic schools in Manitoba. 1896-1911. Sir Wilfrid Laurier premier (Liberal).	1866. Atlantic cable laid. 1870-71. Franco-Prussian War. 1887. First British Colonial Conference. 1899-1902. Boer War in South Africa.
1900	1903. Alaskan boundary dispute settled. 1905. Alberta and Saskatchewan organized as provinces. 1911. Liberals defeated on the question of reciprocity with the United States. 1911-20. Sir Robert Borden premier (Conservative). 1914-18. World War (see separate outline). 1914-18. Canada devotes entire strength to World War. 1920. Arthur Meighen premier National Liberal-Conservative government. 1921. W. L. Mackenzie King premier after Liberal victory in general election. 1930. Richard B. Bennett premier after Conservative victory. 1935. Lord Tweedsmuir governor-general; Liberal victory makes Mackenzie King premier. 1939. British King and Queen make good-will tour; Canada joins Britain in war against Germany. 1940. Mackenzie King government returned in general election; Earl of Athlone governor-general; Canada and United States establish joint board to consider problems of North American defense.	1901. Commonwealth of Australia formed. 1914. Panama Canal opened. 1926. Imperial Conference creates British Commonwealth of Nations. 1930. Beginning of world depression. 1932. British Imperial Conference at Ottawa adopts preferential tariffs. 1939. War breaks out in Europe against Germany, Italy. 1941. Japan declares war.

V. AMERICAN HISTORY—COLONIAL AND REVOLUTION

PERIOD OF DISCOVERY—1000-1600

1000

1000. Leif the Lucky (Northman) discovers America.
1492. Columbus discovers America.
1497. John Cabot discovers Newfoundland, etc.
1513. Ponce de Leon discovers Florida.

1513. Pacific Ocean discovered by Balboa.
1519-21. Conquest of Mexico by Cortez.
1528-36. Narvaez and De Vaca explore the Gulf Region.
1534-43. Cartier discovers and explores the St. Lawrence.

FOUNDING OF THE THIRTEEN COLONIES

1600

VIRGINIA

1607. Jamestown founded (first permanent English settlement). Captain John Smith.
1611-16. "Dale's Rule."
1619. House of Burgesses meets (first representative assembly in America).
1619. First negro slaves introduced.
1624. Virginia becomes a royal colony.

MARYLAND

1632. Maryland granted to Lord Baltimore.
1634. St. Mary's settled by English Catholics.
1647. Representative assembly established.
1649. Act of toleration for all Christians passed.

1642. Berkeley becomes governor.

1652-58. Self-government under the Protectorate.

1676. Bacon's rebellion.

1693. William and Mary College founded.

1700

1710-22. Spotswood governor.

1691. Maryland becomes a crown colony.
1729. Baltimore founded.

NEW YORK

1609. Hudson discovers the Hudson River.
1614. Dutch trading post established on Manhattan Island.

1626. New Amsterdam founded.
1629. Patroon system organized.
1638. Swedes settle along the Delaware.

1655. Dutch seize Swedish colony.
1664. New Amsterdam captured by English fleet; becomes New York.

NEW JERSEY

1664. New Jersey granted to Berkeley and Carteret.
1674. Colony divided into East and West Jersey.
1682. Penn purchases East Jersey.

1683. First assembly in New York.
1688. New York united to New England under Andros.

1702. Two Jerseys re-united as a royal province.

MASSACHUSETTS

1620. Pilgrims land at Plymouth. ("Mayflower" voyage).
1623. New Hampshire settled at Dover.
1630. Boston (Massachusetts Bay Colony) founded.
1636. Roger Williams expelled from Salem.

1636. Harvard College founded.
1643. New England Confederation formed.
1645. Free school at Roxbury.
1652. Massachusetts extends control over Maine.

1675. King Phillip's War in New England; Indian uprising against settlers suppressed.

NEW HAMPSHIRE

1680. New Hampshire separates from Massachusetts.

1684. Massachusetts charter annulled.
1686. Andros becomes governor of New England.
1691. Plymouth unites with Massachusetts.
1692. Salem witchcraft cases.

RHODE ISLAND

1636. Roger Williams founds Providence.

1638. Newport settled.

1663. Rhode Island obtains a charter.

CONNECTICUT

1635. Hartford, Windsor, etc., settled.
1637. Pequot War.
1638. New Haven founded.

1662. Charter granted to Connecticut.

STRUGGLE BETWEEN FRANCE AND GREAT BRITAIN FOR SUPREMACY IN

1689-97. King William's War: New England colonists under Sir William Phips seize Port Royal, Acadia; attack on Quebec fails; Peace of Ryswick restores conquests on each side (1697).

1701-13. Queen Anne's War: frontier raids by French and Indians (Deerfield, 1704; Haverhill, 1708); English capture Port Royal; expedition against

Quebec unsuccessful. France cedes Hudson Bay region, Newfoundland, and Nova Scotia (Acadia) to Great Britain (Treaty of Utrecht, 1713).

1744-48. King George's War: Colonists capture Louisburg (1745); restored to France by Treaty of Aix-la-Chapelle (1748).

1755-63. French and Indian War: expedition against Fort Duquesne fails (Brad-

CONFLICT BETWEEN COLONIES AND PARLIAMENT—

1763. British ministry adopts rigid colonial policy; Navigation Acts restricting colonial commerce to England strictly enforced; renewal of Sugar Act taxing importations from foreign colonies.

1764. Stamp Act resisted in the colonies. Virginia resolutions (1765); Stamp Act Congress protests against colonial policy (1765); Act repealed.

1767. "Townshend Acts" to enforce trade laws and taxing tea, paper, etc. Boston riot (1770); Boston Tea Party (1773).

REVOLUTIONARY WAR—1775-1783

1775. Skirmishes at Lexington and Concord; Capture of Ticonderoga and Crown Point; Battle of Bunker Hill.

1775. Second Continental Congress meets.

1776. British evacuate Boston; naval attack on Charlestown fails.

1776. July 4. Declaration of Independence adopted.

1776-77. Washington retreats across New York and New Jersey (Battles of Long Island, White Plains, Trenton, and Princeton).

1777. British attempt to cut the colonies in two: Burgoyne's and St. Leger's campaign from Canada fails (Oriskany, Bennington, Saratoga). Howe's campaign against Washington (Battle of Brandywine, occupation of Philadelphia, Germantown).

1777. Congress adopts Articles of Confederation (ratified by states, 1777-81).

1777-78. Washington winters at Valley Forge.

1778. France recognizes independence of the colonies; arrival of French army under Rochambeau.

1778. British evacuation of Philadelphia and retreat toward New York (Monmouth).

1778-79. George Rogers Clark marches through Illinois territory; capture of Kaskaskia and Vincennes.

1779. British defeat Americans and French near Savannah; British occupy Georgia.

1779. Naval battle between the 'Bonhomme Richard' and the 'Serapis' (John Paul Jones).

CRITICAL PERIOD—1783 TO 1789

1785. Maryland and Virginia delegates meet at Alexandria to consider commercial relations of the two states.

1786. Annapolis Convention to consider commerce of the country calls general convention at Philadelphia.

1786-87. Shays' rebellion in Massachusetts, caused by heavy taxes and general poverty, suppressed with difficulty.

1787. Northwest Ordinance organizes government in the Northwest Territory.

ARY PERIODS—TO 1789

1542. De Soto discovers the Mississippi River.
1540-42. Coronado explores the Southwest.
1565. Spanish found St. Augustine.
1584-90. Raleigh attempts to establish a settlement on Roanoke Island.

N I E S

OTHER EVENTS IN NORTH AMERICA

1604. Port Royal founded (first permanent French settlement).
1608. Quebec founded by Champlain.
1610. Hudson discovers Hudson Bay; England claims the Hudson Bay region.
1673. Marquette and Joliet explore the Mississippi.
1682. La Salle descends the Mississippi to its mouth.
1701. Detroit founded as French fort and trading post.
1718. French settle New Orleans.

CAROLINA

1663. Charter for Carolina granted to Lord Clarendon and others.
1669. Fundamental constitution drawn up by John Locke.

1680. Charleston settled.

PENNSYLVANIA

1681. Charter for Pennsylvania granted to William Penn.
1682. Philadelphia founded.

GEORGIA

1719-21. Overthrow of proprietary government.
1729-31. Division into North and South Carolina.

SOUTH CAROLINA

NORTH CAROLINA

1733. Georgia settled by Oglethorpe.
1752. Georgia royal colony.

NORTH AMERICA—1689-1763

dock's defeat); expedition against French at Crown Point (Battle of Lake George, 1755); capitulation of French frontier posts (Duquesne, Frontenac, etc.); capture of Quebec by Wolfe (1759). France cedes Cape Breton, Canada, etc., to Great Britain (Treaty of Paris, 1763).

1763-1774

1774. Boston Port Bill closing the port, and other acts to punish Massachusetts.
1774. First Continental Congress draws up Declaration of Rights.

1780. British victory at Camden.

1780-81. War in the South: Charleston captured by the British; battles of King's Mountain, Cowpens, Guilford, Eutaw; Cornwallis retreats to the north.

1781. Siege of Yorktown; surrender of Cornwallis.

1782. Evacuation of Savannah and Charleston; hostilities cease.

1783. Treaty of Paris: Great Britain recognizes the independence of the colonies.

1787. Federal Constitution framed by the Constitutional Convention; ratified by 11 states by end of 1788.

VI. UNITED STATES—1789 TO PRESENT

1789

1789-97. George Washington, President, John Adams, Vice-President.
1789. First Congress meets at New York; State, Treasury, and War departments organized.
1789. First 10 Amendments to the Constitution adopted by Congress and sent to states.
1790. First census: population, 3,929,214.
1790. National debt funded; state debts assumed by federal government.
1790-95. Indian war in the Northwest Territory.
1791. First national bank chartered by Congress.
1791. Vermont admitted; Kentucky (1792); Tennessee (1796).
1793. Eli Whitney invents the cotton gin.
1794. Genet, minister from France, recalled for unneutral acts.
1794. Whisky rebellion in western Pennsylvania against internal revenue law.
1794. Jay treaty of amity and commerce with Great Britain.

1797

1797-1801. John Adams, President (Federalist); Thomas Jefferson, Vice-President (Democratic-Republican).
1797. X Y Z Affair with France leads to naval war; Alien and Sedition Acts passed against French partisans.
1798. Virginia and Kentucky resolutions directed against Alien and Sedition Acts assert right of nullification.
1798. Eleventh Amendment adopted.
1800. Presidential election: Republicans holding democratic ideas of strict construction and "states' rights" defeat aristocratic Federalists advocating strongly centralized government.
1801. John Marshall made Chief Justice.

1801

1801-09. Thomas Jefferson, President (Democratic-Republican); Aaron Burr (1801-05), George Clinton (1805-09), Vice-Presidents.
1801-05. War with Tripoli; end of tribute to Barbary states.
1803. Ohio admitted.
1803. Louisiana Purchase from France extends U. S. boundary to Rockies.
1804. Twelfth Amendment provides separate ballots for president and vice-president.
1807. Fulton's steamboat makes successful trial voyage.
1807. Dispute with Great Britain over neutral commerce and the impressment of seamen (Chesapeake Affair).
1807-09. Embargo against Great Britain and France in retaliation for their blockade of European ports.
1808. Importation of slaves prohibited.

1809

1809-17. James Madison, President (Democratic-Republican); George Clinton (1809-13), Elbridge Gerry (1813-17), Vice-Presidents.
1811-14. Indian war in the West (Tippecanoe).
1812. Louisiana admitted; Indiana (1816).
1812-15. War with Great Britain. Unsuccessful invasions of Canada (1812, 1814); British take Washington (1814); Battle of New Orleans (1815). Numerous naval duels; Perry's victory on Lake Erie (1813). Treaty of Ghent (1814).
1814. Hartford Convention protests against embargo and war.
1816. Second national bank chartered.
1816. Mildly protective tariff passed.

1817

1817-25. James Monroe, President (Democratic-Republican); D. D. Tompkins, Vice-President (1817-25).
1817. Mississippi admitted; Illinois (1818); Alabama (1819); Maine (1820); Missouri (1821).
1817. Seminole Indian War in Florida.
1818. Great Britain and the United States agree upon joint occupation of Oregon territory.
1819. Florida acquired from Spain.
1820. Missouri Compromise on question of slavery in territories.
1823. Monroe Doctrine advanced against the aggression of the Holy Alliance in America.
1824. Protective tariff passed.
1824. Internal Improvements Bill passed.

1825

1825-29. John Quincy Adams, President (Democratic-Republican); John C. Calhoun, Vice-President.
1825. Erie Canal completed.
1828. "Tariff of Abominations"; tariff becomes a live issue.

OTHER COUNTRIES

1789. French Revolution begins.

1793. War between France and England.
1793-94. Reign of Terror in France.

1799. Napoleon made First Consul.

1804. Napoleon becomes emperor.
1806. Napoleon establishes Continental ("paper") Blockade.
1806. England issues Orders in Council blockading French territories.

1810-25. Spanish and Portuguese colonies in Central and South America become independent.

1815. Battle of Waterloo.
1815. Treaty of Vienna; Holy Alliance formed.

1821. Russia attempts to restrict trade on North Pacific coast.

VI. UNITED STATES HISTORY (Continued)

		OTHER COUNTRIES
1829	<p>1829-37. Andrew Jackson, President (Democrat); John C. Calhoun (1829-33), Martin Van Buren (1833-37), Vice-Presidents.</p> <p>1829. "Spoils system" appointments to office.</p> <p>1830. Webster-Hayne debate on "state rights."</p> <p>1830. Baltimore and Ohio Railway opened, first steam locomotive in America.</p> <p>1831. William Lloyd Garrison establishes <i>The Liberator</i>, a journal advocating abolition of negro slavery.</p> <p>1831. McCormick invents the reaper.</p> <p>1832. New tariff bill reduces duties but retains principle of protection.</p> <p>1832. South Carolina passes ordinance "nullifying" the tariff; Jackson's proclamation denounces nullification; "Force Bill" passed (1832); Compromise tariff (1833); nullification ordinance repealed.</p> <p>1832. Jackson reelected; system of national nominating conventions begins.</p> <p>1832-37. Jackson's war on the National Bank; act for renewal of charter vetoed.</p> <p>1835-42. War against Seminole Indians in Florida.</p> <p>1836. Arkansas admitted; Michigan (1837).</p> <p>1836. "Specie circular" issued requiring the payments for public lands to be made in specie.</p>	<p>1830. Independent monarchy established in Belgium.</p> <p>1830. Louis Philippe ascends French throne.</p> <p>1832. English parliamentary Reform Bill passed.</p> <p>1835. Texas secedes from Mexico and establishes an independent state.</p>
1837	<p>1837-41. Martin Van Buren, President (Democrat); R. M. Johnson, Vice-President.</p> <p>1837. Financial panic, due to over-speculation and unsound financial policies.</p> <p>1840. Independent treasury established.</p> <p>1840. "Hard cider" campaign results in a Whig victory.</p>	<p>1837. Queen Victoria of England begins her long reign.</p>
1841	<p>1841. William Henry Harrison, President (Whig); John Tyler, Vice-President.</p> <p>1841. Death of Harrison.</p> <p>1841-45. John Tyler, President (Whig).</p> <p>1841. Tyler vetoes bill to reestablish the national bank (1841) and bill for a "Fiscal Corporation"; break between Tyler and the Whigs; entire cabinet resigns.</p> <p>1842. Webster-Ashburton treaty with Great Britain settles the Northeast boundary dispute.</p> <p>1842. Dorr Rebellion in Rhode Island secures liberal constitution.</p> <p>1844. First telegraph, between Washington and Baltimore, completed.</p> <p>1844. James K. Polk (Democrat) elected President.</p> <p>1845. Texas annexed to the United States; Florida admitted.</p>	
1845	<p>1845-49. James K. Polk, President (Democrat); George M. Dallas, Vice-President.</p> <p>1846. Iowa admitted; Wisconsin (1848).</p> <p>1846. Northwest boundary line settled at 49th parallel by treaty with Great Britain.</p> <p>1846. Low tariff enacted.</p> <p>1846-48. Mexican War. American victories at Buena Vista (1847); Cerro Gordo (1847); capture of Mexico City (1847). Treaty of Guadalupe Hidalgo (1848), Mexico relinquishes claims to Texas; cedes New Mexico and Upper California to United States.</p> <p>1846. Wilmot Proviso prohibiting slavery in territories acquired from Mexico defeated.</p> <p>1848. Territory of Oregon organized without slavery.</p> <p>1848. Presidential election results in Whig victory. Formation of the Free Soil Party.</p>	<p>1846. Great Britain repeals corn laws; free trade established.</p> <p>1848. Revolutions in France and Italy; second French Republic founded.</p>
1849	<p>1849-50. Zachary Taylor, President (Whig); Millard Fillmore, Vice-President.</p> <p>1849. Rush of gold seekers to California.</p> <p>1850. Clayton-Bulwer treaty with Great Britain provides that neither country should have exclusive control over any canal built across Nicaragua or Panama isthmus.</p> <p>1850. Death of President Taylor.</p> <p>1850-53. Millard Fillmore, President (Whig).</p> <p>1850. "Clay's Compromise": California admitted as a free state; other territory acquired from Mexico left open to slavery; slave trade abolished in the District of Columbia; new Fugitive Slave Law enacted.</p> <p>1850. Maine adopts prohibition.</p> <p>1851. Rail connection established between New York City and Lake Erie at Buffalo.</p> <p>1852. "Uncle Tom's Cabin" published; stimulates growth of abolition sentiment in North.</p> <p>1852. Franklin Pierce (Democrat) elected president.</p>	<p>1852. Louis Napoleon proclaimed emperor of France.</p>
1853	<p>1853-57. Franklin Pierce, President (Democrat); William R. King, Vice-President.</p> <p>1853. Gadsden Purchase settles boundary dispute with Mexico.</p> <p>1854. Kansas-Nebraska Bill repeals Missouri Compromise and organizes Kansas and Nebraska on the principle of "squatter sovereignty." Civil war in Kansas between free state and slave state settlers (1855-57).</p> <p>1854. Treaty with Great Britain establishes reciprocity with Canada.</p> <p>1854. Admiral Perry secures the opening of Japanese ports to foreign trade.</p> <p>1854-55. "Know Nothing" Party, a secret party opposed to foreigners participating in American politics, at the height of its power.</p> <p>1854-55. Movement to add slave territory to the United States; Ostend manifesto favors annexation of Cuba (1854); filibustering expedition to Nicaragua (1855).</p> <p>1856. First Republican national convention adopts anti-slavery platform.</p>	<p>1854-56. Crimean War.</p>
1857	<p>1857-61. James Buchanan, President (Democrat); J. C. Breckenridge, Vice-President.</p> <p>1857. Dred Scott decision maintains that neither negro slaves nor their descendants can become citizens; that a slave does not become free by being carried to free territories.</p> <p>1858. Minnesota admitted; Oregon (1859); Kansas (1861).</p> <p>1859. John Brown's raid on the United States arsenal at Harper's Ferry.</p> <p>1860. Abraham Lincoln (Republican) elected president; South Carolina secedes from the Union.</p> <p>1861. Ten other Southern States secede and form the Confederacy.</p>	<p>1861. Italy united under Victor Emmanuel.</p>
1861	<p>1861-65. Abraham Lincoln, President (Republican); Hannibal Hamlin (1861-65), Andrew Johnson (1865), Vice-Presidents.</p> <p>1861-65. Civil War.</p> <p>1861. Apr. 12. Fort Sumter fired upon by the Confederates.</p> <p>1861. July 21. Union army defeated at Bull Run.</p> <p>1861. Seizure of Confederate commissioners (Mason and Slidell) from British steamship nearly leads to war.</p> <p>1862. Apr. 6-7. Grant's victory at Shiloh; McClellan's peninsular campaign (Mar.-July); naval battle (Mar. 9) between Monitor and Merrimac; New Orleans captured by Farragut (Apr. 23).</p> <p>1862. Slavery abolished in the District of Columbia.</p> <p>1863. Jan. 1. Lincoln issues the Emancipation Proclamation.</p> <p>1863. July 1-3. Union victory at Gettysburg; Vicksburg captured (July 4).</p> <p>1863. West Virginia admitted as a free state.</p> <p>1864. Grant made commander-in-chief of the Union armies. Sheridan's raid up the Shenandoah Valley; Sherman's march to the sea; capture of Mobile.</p> <p>1864. Nevada admitted.</p> <p>1864. Lincoln reelected.</p> <p>1865. Apr. 9. Lee surrenders at Appomattox Court House.</p> <p>1865. Apr. 14. Lincoln assassinated.</p>	<p>1861-68. William I king of Prussia.</p> <p>1863-67. Maximilian attempts to found monarchy in Mexico.</p>

VI. UNITED STATES HISTORY (Continued)

		OTHER COUNTRIES
1865	<p>1865-69. Andrew Johnson, President (Republican administration, but Johnson a Democrat). 1865. Proclamation extending amnesty to the South (14 classes excepted). 1865. Thirteenth Amendment prohibits slavery in the United States. 1865-67. President quarrels with Congress over the reconstruction policy; Congress passes over his veto Civil Rights Bill to extend citizenship to freedmen (1866), act continuing Freedmen's Bureau, Reconstruction Act (1867), and Tenure of Office Bill (1867). 1867. Alaska purchased from Russia; Nebraska admitted to the Union. 1867. Johnson forces French to withdraw army from Mexico. 1868. President impeached; conviction fails by one vote (two-thirds of Senate required). 1868. Fourteenth Amendment extends citizenship to freedmen.</p>	<p>1866. Austro-Prussian War. 1866. Permanent Atlantic cable laid. 1867. Dual monarchy of Austria-Hungary established.</p>
1869	<p>1869-77. Ulysses S. Grant, President (Republican); Schuyler Colfax (1869-73), Henry Wilson (1873-77), Vice-Presidents. 1870. Fifteenth Amendment extends franchise to the negroes. 1871. Treaty of Washington with Great Britain provides for a clearer definition of the Oregon boundary, settlement of disputes over the Canadian fisheries, and arbitration of the "Alabama claims." 1872. General Amnesty Act restores most of the ex-Confederates to their civil and political rights. 1872. Grant reelected; National Reform-Labor Party adopts platform of labor and economic reform; Prohibition Party names presidential candidates. 1873. Financial panic. 1873. Grant vetoes bill to increase paper money; Congress decides to resume specie payments (1875). 1872-74. Political scandals: "Credit Mobilier" implicates public men in Union Pacific scandal; "Salary Grab" Act greatly increasing congressmen's salaries (1873); Whiskey Ring conspiracy to defraud government of internal revenue on distilled liquors (1874). 1876. Colorado admitted. 1876. Election returns disputed; commission declares Republican candidate elected (Rutherford B. Hayes). 1876. Custer Indian massacre in Montana. 1876. Alexander Graham Bell invents the telephone.</p>	<p>1869. Suez Canal opened. 1870-71. Franco-Prussian War. 1870. Third French Republic proclaimed. 1870. Union of Italy completed. 1871. German Empire established.</p>
1877	<p>1877-81. Rutherford B. Hayes, President (Republican); William A. Wheeler, Vice-President. 1877. Federal troops withdrawn from the South. 1877. Railroad and miners' strikes contribute to widespread industrial depression. 1878. Greenback Party favoring "cheap money" at height of power. 1878. Bland-Allison Act for purchase and coinage of silver passed over Hayes' veto. 1879. Specie payments resumed. 1879. Thomas A. Edison invents the electric light. 1880. Hayes fails of renomination because of his differences with party politicians.</p>	<p>1877-78. Russo-Turkish War.</p>
1881	<p>1881. James A. Garfield, President (Republican); Chester A. Arthur, Vice-President. 1881. Garfield assassinated (July 2). 1881-85. Chester A. Arthur, President (Republican). 1883. Pendleton Civil Service Reform Bill passed. 1884. Civil government established in Alaska. 1884. Bitter presidential election campaign; independent Republicans ("Mugwumps") swing to Democratic support.</p>	<p>1882. Triple Alliance formed between Germany, Austria, and Italy. 1884. Partition of Africa.</p>
1885	<p>1885-89. Grover Cleveland, President (Democrat); T. A. Hendricks, Vice-President. 1885. Immigration of contract laborers forbidden. 1887. Interstate Commerce Act passed; beginning of national regulation of railroads. 1888. Bill for tariff for revenue only fails to pass Congress. 1889. Department of Agriculture established.</p>	<p>1888-1918. William II emperor of Germany.</p>
1889	<p>1889-93. Benjamin Harrison, President (Republican); Levi P. Morton, Vice-President. 1889-90. Admission of North and South Dakota, Idaho, Montana, Washington, and Wyoming. 1889. Oklahoma thrown open to settlement. 1890. McKinley tariff establishes protectionist principle. 1890. Sherman Anti-Trust Act passed to prevent monopolies by corporations. 1890. Silver Purchase Act provides for monthly purchases of silver to be paid for in treasury notes. 1890. Controversy with Germany over the Samoan Islands settled by the Treaty of Berlin. 1891. People's Party (Populists) formed. 1892. Cleveland (Democrat) elected again on tariff issue. 1892-1896. Development of the automobile. 1893. Bering Sea controversy with Great Britain referred to arbitration.</p>	<p>1891. Dual Alliance of France and Russia announced.</p>
1893	<p>1893-97. Grover Cleveland, President (Democrat); Adlai E. Stevenson, Vice-President. 1893. Financial panic; Silver Purchase Act repealed and gold standard supported. 1894. Tariff duties reduced; Pullman railroad strikes suppressed by Federal troops. 1895. United States demand for arbitration of British-Venezuelan controversy acceded to by Great Britain. 1896. Utah admitted to the union.</p>	
1897	<p>1897-1901. William McKinley, President (Republican); Garret Hobart (1897-1901), Theodore Roosevelt (1901), Vice-Presidents. 1897. Dingley tariff reestablishes high protection. 1898. United States battleship Maine blown up in Havana harbor. 1898. Spanish-American War; Spanish fleets destroyed at Manila Bay and Santiago; invasion of Cuba. Spain recognizes Cuban independence; Porto Rico, Guam, and the Philippines ceded to United States; Cuba occupied by United States until 1902. 1898. Hawaii annexed to the United States; Samoan Islands divided with Germany. 1899. Insurrection in the Philippines suppressed; civil government established. 1899. Secretary Hay obtains recognition of the "Open Door" policy toward China. 1900. Currency law adopts gold standard; McKinley reelected on the "full dinner-pail" platform. 1901. McKinley assassinated (Sept. 6).</p>	<p>1897. Marconi perfects the wireless telegraph. 1899-1902. Boer War in South Africa. 1899. First Hague Peace Conference. 1900. Boxer uprising in China.</p>

VI. UNITED STATES HISTORY (Concluded)

		OTHER COUNTRIES
1901	<p>1901-09. Theodore Roosevelt, President (Republican); Charles W. Fairbanks, Vice-President (1905-09). 1901. Hay-Pauncefote treaty with Great Britain allows United States to build Panama Canal on condition that it be open to all nations on equal terms. 1902. French interests in Panama Canal purchased; canal zone obtained from Panama by treaty (1904). 1903. Alaskan boundary dispute with Great Britain settled. 1903. Beginning of stricter government regulation of transportation and trade; Department of Commerce and Labor created, railroad rebates abolished (1903); jurisdiction of Interstate Commerce Commission extended (1905); suits brought against trusts under Sherman Anti-Trust Law; Hepburn Act regulating railroad rates passed (1906); Meat Inspection and Pure Food Acts passed (1906). 1903. Development of democratic government; state-wide primary election law in Wisconsin followed by widespread adoption in other states; initiative and referendum adopted by Oregon (1902). 1903. Wright brothers make first airplane flight at Kitty Hawk, N. C. 1905. Intervention in Santo Domingo to establish financial responsibility. 1906-09. Intervention in Cuba to restore order following armed revolt. 1907. Oklahoma admitted as a state.</p>	<p>1901-10. Edward VII king of England 1902. Trans-Siberian railway opened. 1903. Panama declares itself an independent republic; immediate recognition by President Roosevelt. 1904-1905. Russo-Japanese War; mediation of Roosevelt results in the Peace of Portsmouth. 1907. Second Hague Peace Conference 1907. Triple Entente formed between Great Britain, France, and Russia. 1908-1909. Naval Conference at London adopts rules for naval warfare.</p>
1909	<p>1909-13. William Howard Taft, President (Republican); James S. Sherman, Vice-President. 1909. Dispute with Venezuela arbitrated. 1909. Payne-Aldrich tariff passes; rules of the House of Representatives reformed. 1910. Postal savings bank created; parcel post, 1912. 1911. Bills for tariff reductions vetoed by President. 1912. Panama Canal Tolls Act exempts American coastwise shipping from tolls. 1912. Arizona and New Mexico admitted as states; territorial government established in Alaska. 1912. Taft renominated; Progressive party nominates Roosevelt; Woodrow Wilson, Democrat, elected. 1913. Sixteenth Amendment gives Congress power to levy income tax.</p>	<p>1909. Peary reaches North Pole. 1910. George V king of England. 1911. Revolution in Mexico; Diaz resigns. 1911-12. War between Italy and Turkey in Tripoli. 1911. Amundsen reaches South Pole. 1912-13. Turkish-Balkan wars. 1912. Chinese republic proclaimed.</p>
1913	<p>1913-21. Woodrow Wilson, President (Democrat); Thomas R. Marshall, Vice-President. 1913. Seventeenth Amendment provides for election of senators by the people. 1913. Underwood-Simmons tariff lowers duties; Federal Reserve system of banks created. 1914. Federal Trade Commission created; Clayton Anti-Trust Act passed; graduated income tax law passed. 1914. Panama Canal Tolls Act repealed; canal opened. 1914. Dispute with Mexico over "Tampico incident"; American troops occupy Vera Cruz. 1914. Neutrality in European war proclaimed. 1916. Tariff Commission created; Adamson Law establishes eight-hour day for railway employees. 1916. Punitive expedition sent into Mexico. 1916. Wilson re-elected on a peace platform. 1917. War declared against Germany (see Chart III for First World War). 1918. Republican Congress elected. 1918. Armistice signed by Germany (see Chart III for First World War). 1919. Eighteenth Amendment establishes nation-wide prohibition. 1919. Treaty of Versailles fails to receive two-thirds majority in the Senate. 1920. Nineteenth Amendment establishes nation-wide woman suffrage.</p>	<p>1914. Direct wireless communication established between Germany and United States. 1914-18. First World War. 1917. Denmark sells Virgin Islands to United States. 1919. Treaty of Versailles signed. 1919. First transatlantic flights, both airplane and dirigible. 1920. League of Nations established.</p>
1921	<p>1921. Warren G. Harding, President (Republican); Calvin Coolidge, Vice-President. 1921. Budget Bill passed establishing budget system in national finance. 1921. Treaty with Colombia ratified paying her \$25,000,000 to settle Canal Zone dispute. 1921. Bill passed greatly restricting immigration. 1921. President signs joint Congressional resolution declaring peace with Germany and Austria (July 2). 1921-22. Limitation of Armament Conference at Washington prepares Four Power Treaty between U. S., Great Britain, France, and Japan, for maintaining peace in the Pacific, and Five Power Naval Treaty between U. S., Great Britain, France, Italy, and Japan limiting naval tonnage. 1922. Strikes of coal miners and railroad shop workers keep a million men idle. 1922. Fordney-McCumber Tariff Act passed, raising duties to high level. 1923. President Harding dies (Aug. 2).</p>	<p>1921. Famines in Russia and China. 1921. Ex-Emperor Charles unsuccessfully attempts to regain throne of Hungary; exiled to Madeira. 1922. European economic conference, including German and Russian delegates, at Genoa. 1922. Tomb of King Tutankhamen of Egypt (about 1350 B. C.) discovered near Luxor.</p>
1923	<p>1923. Calvin Coolidge, President (Republican). 1924. Investigation of leasing of government oil reserves to private interests creates national scandal. 1924. Immigration law passed limiting immigration to 2 per cent of foreign-born of each nationality here in 1890; Japanese exclusion provision creates intense feeling in Japan. 1924. Soldiers' bonus bill passed over President's veto; taxes reduced. 1924. Army aviators make round-the-world flight. 1924. Coolidge re-elected; Charles G. Dawes, Vice-President. 1927. Greatest Mississippi River flood ever known causes immense crop and property losses. 1928. Secretary of State Kellogg negotiates "Pact of Paris" by which nearly all the nations in the world renounce war as an instrument of national policy.</p>	<p>1926. Pilsudski sets up dictatorship in Poland. 1926. British dominions recognized as autonomous units in the empire. 1927. Acute conflict between Mexican government and Church; controversy with United States over oil and land laws. 1927. United States intervenes to end civil war in Nicaragua.</p>
1929	<p>1929. Herbert Hoover, President (Republican); Charles Curtis, Vice-President. 1929. President calls special session of Congress to consider problems of farm relief and changes in the tariff. 1929. President Hoover appoints Federal Farm Board. 1929. World-wide economic depression begins; stock markets collapse; banks fail; millions unemployed. 1930. Hawley-Smoot bill raises tariff. 1931. Democratic House elected; John N. Garner of Texas, speaker. 1932. Relief measures to meet depression adopted; Reconstruction Finance Corporation set up to lend federal funds; Home Loan Bank system established; tariffs and taxes increased.</p>	<p>1929. Byrd flies over South Pole. 1929. Tacna-Arica boundary settled. 1930. United States, Great Britain, and Japan agree on new naval reductions at London Naval Conference. 1931. Great Britain drops gold standard. 1931-32. Japan invades Manchuria, sets up Manchukuo.</p>
1933	<p>1933. Franklin D. Roosevelt, President (Democrat); John Nance Garner, Vice-President. 1933. Congress enacts first "New Deal" program (NRA for business; AAA for agriculture; abandonment of gold standard); Soviet Russia recognized. Prohibition (18th) amendment repealed. 1935. Congress passes Wagner labor act and Social Security Act. Huge appropriations for work relief. Supreme Court kills NRA. Philippine independence voted. New neutrality policy established. 1936. Supreme Court kills AAA. Veterans' bonus paid. Roosevelt and Garner re-elected. 1940. Huge rearmament program, peacetime conscription, adopted; Act of Havana with Latin American nations and joint defense board with Canada; 99-year leases for American bases in British possessions in Western Hemisphere. 1940. Roosevelt re-elected, with Henry A. Wallace, Vice-President. 1941. Lend-Lease Act for material aid to nations fighting aggression; Iceland occupied. 1941. Japanese attack Pearl Harbor; U. S. goes to war against Japan, Germany, and Italy. 1941. Guam and Wake Island captured; General MacArthur's forces begin heroic defense of the Philippines. 1942. Philippines lost after fall of Bataan and Corregidor; MacArthur directs defense of Australia. 1942. U. S. naval forces win battles in Coral Sea, at Midway, and in Solomon Islands; large American expeditionary force concentrated in Great Britain and Northern Ireland. 1942-43. U. S. troops invade North Africa; aid British in driving Axis forces from Tunisia.</p>	<p>1933-5. War between Bolivia and Paraguay over Gran Chaco boundary. 1934. Nazi policies disturb Europe; Chancellor Dollfuss of Austria and King Alexander of Yugoslavia assassinated. 1934. Japan ends naval limitation. 1937-38. Japan conquers much of China. 1938. Germany annexes Austria and most of Czechoslovakia. Paraguay-Bolivia dispute ended. 1940-41. Twenty-one American republics resolve to act jointly for defense of Western Hemisphere. 1942. Twenty-six United Nations pledge mutual assistance against Axis.</p>

Reference-Outline for Current Events



These stalwart, grim-faced American troops symbolize Allied determination to beat the Axis into total defeat

THIS OUTLINE is designed to give the student, the teacher, and the general reader a clear and orderly review of the chief events and trends of our time. In so doing, it promotes one of the chief aims of education today, which is to train people to understand the responsibilities of this critical period.

Common sense tells us that we cannot form intelligent opinions or plan our lives effectively without a general knowledge of what is going on in the world around us. But this knowledge is not easy to get. The textbooks summarizing and explaining today's history are still to be written. Press and radio overwhelm us hour by hour with a confusing mass of facts, reports, and comments. The impact of today's headlines blurs the memory of what happened yesterday.

This outline is offered as a guide in the maze. It presents no completed picture but merely traces the general pattern of history in the making.

The page references are keys to the vast amount of new material added to these volumes year by year in the various fields that are affected by the march of our civilization. Thus the outline not only covers political events and advances in science and industry, but it also presents an organized view of the social, cultural, and economic developments of the day.

To make relationships clear, the outline goes back in many instances as far as the first World War. But its arrangement is intended to focus attention primarily on current events and problems—on what may be called the world's unfinished business.

STRUGGLE FOR WORLD MASTERY—DICTATORSHIP VERSUS DEMOCRACY

Europe in Crisis

I. ORIGINS OF CRISIS IN FIRST WORLD WAR: W-173-8, E-326.

A. Revision of Frontiers: W-173-4, E-326f maps.

a. Rise of New States:

1. In the Baltic: Esthonia E-306; Latvia L-71; Lithuania L-164; Finland F-44.
2. In Central Europe: Poland W-173, P-276-7; Czechoslovakia C-421.
3. In Southeastern Europe: Yugoslavia Y-212.

b. States Reduced in Area: W-173-4, E-326f maps.

- Germany W-173; Austria W-174, A-377; Hungary W-174, H-361-2; Bulgaria B-271; Turkey T-159, T-164, W-174.

B. Immediate Consequences of the War: W-178a-c.

- a. Bolshevik Revolution in Russia: R-188-90, B-170.
- b. Unrest in the British Empire: Ireland I-128-9; Egypt E-201; India I-40, G-4.

- c. Establishment of Fascist Régime in Italy: I-158-9, F-17, M-325.

- d. Large National Debts and Reparations: W-175-7; N-13, F-182, E-276.

- e. Dislocation of Trade within New Frontiers: W-177, D-14, A-379, B-271.

- f. New Problems of Racial and Religious Minorities: M-5, Y-212, R-176, C-421, P-278, J-218.

II. DEVELOPMENT OF THE CRISIS: E-326a, W-178.

A. World Depression:

- a. Unemployment Becomes Acute: E-276-276a.
- b. Rebirth of Economic Nationalism: T-13a, I-110d-12, E-276a.

B. Spread of Political Discontent:

- a. Dissatisfaction with Democratic Institutions: D-67c-d, F-17, G-75-6, F-182, I-158-9, S-231b.
- b. Rise of Socialist and Labor Governments: in England E-276; France F-182; Spain S-231c-d

ON THE DIFFICULT ROAD TO ROME



These American artillerymen are carrying heavy mortar shells up to gun positions in Italy. The rugged Italian terrain shown here aided the stiff German resistance that slowed the Allied advance northward against Rome.

- c. Spread of Dictatorships: D-67c-68, E-326a. Turkey T-165; Hungary H-362; Spain S-231a; Poland P-279; Portugal P-315; Baltic States D-67d; Austria A-379; Bulgaria B-271; Yugoslavia Y-212; Greece G-163.
- C. New Philosophies of Government: G-126, S-180-1, D-67c-68, D-47-8.
 - a. Mussolini Evolves Principles of Fascism in Italy: F-17-18, M-325.
 - b. Hitler Establishes National Socialism in Germany: G-75-76a, F-17-18, H-311.
 - c. Stalin Develops Autocratic Rule in Russia: R-194a-b, C-324d.
- D. Breakdown of the League and the Versailles Treaty: L-78, W-178, G-76a-b, E-276b, J-192.
 - a. Germany Withdraws from the League: G-76a.
 - b. Europe Rearms: W-178, P-92, G-76a-b, F-182, I-160, E-276b, R-194-194a, A-308, N-56f.
- III. AGGRESSION BY THE FASCIST POWERS (1931-39) E-326a-b, W-178b-c.
 - A. Alignments of the Nations: E-326a-b.
 - a. Germany, Italy, and Japan Form Powerful "Anti-Comintern" Alliance: E-326a-b, G-76a, J-192.
 - b. England and France Together Adopt "Appeasement" Policy: E-326b, E-276b, F-182, R-194b. —British and French Leaders: Chamberlain C-137b; Daladier F-182.
 - B. Japan Conquers Manchuria (1931-32) and Invades China (1937): J-192, C-221m-o, P-10, M-49a-b.
 - C. Italy Wins Ethiopia (1935-36) and Seizes Albania (1939): I-160, E-326a-b, E-309, A-107.

- D. Fascists Victorious in Spanish Civil War (1936-39): S-231d-232, E-326a-b, I-160, R-194a, F-182, F-187.
- E. Germany under Hitler Becomes Dominant in Continental Europe: G-76a-b, E-326a.
 - a. Reoccupies the Rhineland (1936): G-76a.
 - b. Annexes Austria (1938): A-379.
 - c. Obtains Part of Czechoslovakia by Munich Pact (1938): C-421, E-276b.
 - d. Annexes Czechoslovakia (1939): C-421-2.
 - e. Takes Memel from Lithuania (1939): L-164.
 - f. Signs Nonaggression Pact with Russia (1939): W-178c, G-76b, R-194b.

Second World War Begins

- I. WAR SPREADS OVER EUROPE: W-178a-u.
 - A. Great Britain and France Declare War over Nazi Invasion of Poland: W-178c-d, E-277, F-182.
 - B. Poland Conquered and Partitioned by Germany and Russia: W-178d-e, P-279.
 - C. War Active on Sea, Deadlocked on Land (Winter 1939-40): W-178e-f.
 - D. Russia Extends Its Rule in the Baltic: W-178f-g.
 - E. Germany Sweeps across Western Europe (Spring and Summer 1940): W-178g-j, W-178p-q maps.
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- I. VITAL FACTORS IN FAR EASTERN SITUATION: P-10-11, A-333-4.
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 - B. Vast Market Provided by Asia's Millions: A-328.
 - C. Problems of Overpopulation: A-330, C-210, I-31; pictographs C-213, J-186a.
 - D. Large Foreign Investments: P-10, C-221k.
 - E. Objections to Foreign Control: A-333-4, C-221l-m, J-191b-92, I-40.
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 - C. Japan's Growing Strength: J-191a-92, P-10.
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 - B. Antagonism between Japan and Russia: J-191b-92, R-198, R-194b.
 - C. Conflict of China and Japan: J-191b, C-221l-n.
 - a. Japan Conquers Manchuria: M-49-49b.
 - b. Outbreak of "Undeclared War" on China in 1937: C-221n-o, W-178l.
 - D. Japan Seeks to Dominate "Greater East Asia": J-192.
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 - A. Key Positions in Southwest Pacific Quickly Captured: W-178x.
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 - b. Netherlands Indies Overwhelmed: W-178x.
 - c. Philippines Taken after Heroic Resistance at Bataan and Corregidor: W-178x.

THE EAST AND THE WEST MEET



Madame Chiang Kai-shek, wife of China's president and generalissimo (in background), greets Wendell L. Willkie in the capital city of Chungking in 1942. Mr. Willkie was on a world-girdling flight to observe world conditions at first hand. China's leaders impressed upon Mr. Willkie the necessity for receiving greater aid from the other United Nations in order to continue the gallant Chinese fight against Japanese aggression. In 1943 Madame Chiang further cemented East-West unity when she made a good-will speaking tour of the United States.

- B. MacArthur Takes Command of Forces Defending Australia: M-1, W-178y.
- C. Invasion of Burma Threatens India: W-178x.
- D. Japanese Invade Aleutians: W-178y.
- E. Action in the Solomon Islands, Coral and Bismarck Seas: W-178y.
- F. Americans Recapture Aleutians: W-178y, W-179.
- G. Allies Launch Offensive against Japanese in Southwest Pacific Islands: W-178y-179.

Note: For further references on the war in the Pacific, consult the Reference-Outline for United States in the second World War, W-180.

CHANGING CONDITIONS IN THE UNITED STATES

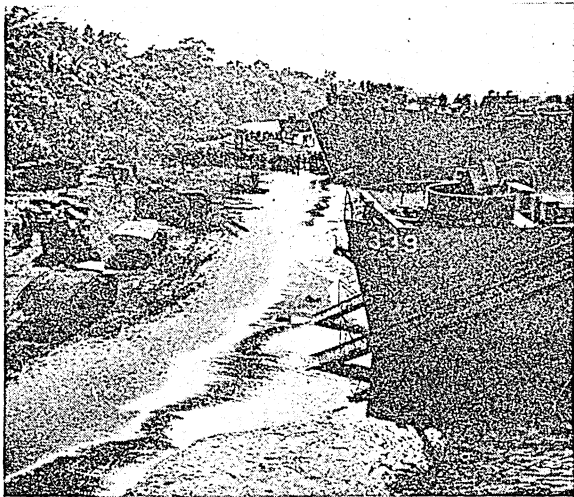
Aftermath of First World War

- I. U. S. WITHDRAWS FROM EUROPE: U-250.
 - A. President Wilson's Peace Program Fails: W-110-11.
 - Senate Opposes League of Nations: W-111.
 - B. Harding Elected on Anti-League Platform: H-218.
- II. IMMEDIATE EFFECTS OF WAR:
 - A. United States Becomes World's Chief Creditor Nation: U-196, I-110c.
 - B. Growth of Nationalism:
 - a. Drastic Restriction of Immigration Begins: I-23.
 - b. High Protective Tariff Restored: H-219.
 - C. Problems of Reconstruction: H-218.
 - Surplus Farm Production: H-219-20.
 - D. Experiment with Prohibition: P-350.
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 - A. Business Booms under Coolidge: C-353-4.
 - B. Boom Collapses during Hoover Régime: U-251.
 - a. Conditions Leading to Depression: H-336.
 - b. Hoover's Relief Measures: H-337.

The "New Deal"

- I. DEMOCRATS WIN SWEEPING VICTORY: U-251.
- II. PRESIDENT ROOSEVELT'S "NEW DEAL" PROGRAM: R-146e-f.
 - A. Measures Intended for Immediate Relief:
 - a. Banking Holiday Proclaimed: B-44.
 - b. Gold Standard Abandoned: R-146h.
 - c. Direct Aid to Unemployed: R-146e.
 - d. Emergency Farm Relief: F-12.
 - e. Assistance to Industry: R-146f.
 - B. Efforts to Achieve Far-Reaching Reforms:
 - a. Plan to Regulate Industry (NRA): R-146f.
 - b. Long-Range Farm Program: A-56b, F-12.

SUPPLY BASE IN NEW GUINEA



The task of getting supplies and weapons to the fighting men is an important and difficult part of any military operation. In this picture, trucks, tanks, and other equipment are being unloaded on a beach in New Guinea from shallow landing craft that have run their noses up on the sand. Ramps come down, huge bow doors open, and out pour the materials of war.

- c. Protection of Savings and Investments: Insurance of Bank Deposits B-43; Supervision of Security Issues and Stock Exchanges S-292.
- d. "Managed Currency" Policy: M-222, R-146h.
- e. Social Security: Old-Age Benefits and Unemployment Compensation S-179.
- f. Low-Cost Housing and Slum Clearance: B-265, R-146f.
- g. Labor Legislation: Regulation of Wages and Hours of Work and Guarantee of Right to Collective Bargaining R-146l, L-44d.
- h. Education and Training of Youth (CCC and NYA): R-146g.
- i. Experiment in Social and Economic Planning (TVA): T-49.
- C. Rejection of Supreme Court Reorganization: R-146k-l.
- D. New Power of Organized Labor: L-44a-b, R-146k.
- III. ROOSEVELT'S RE-ELECTION FOR A THIRD TERM: R-146o.
- Foreign Affairs Overshadow Domestic Program: R-146o-p.
- IV. MOUNTING CRITICISM OF THE ADMINISTRATION: R-146r.
- A. Congress Ignores High Tax Demands: R-146r.
- B. Soldier Vote Controversy: R-146r.

Foreign and Defense Policies of U. S.

- I. EFFORTS TOWARD WORLD PEACE:
 - A. American Influence on Arbitration: A-246.
 - B. Washington Conference on Limitation of Armaments (1921-22) Brings Ten-Year Naval Holiday: H-219.
 - C. Nine-Power Pact Guarantees Territorial Integrity of China: H-219, C-221l-m.
 - D. Kellogg-Briand Treaty (Paris Pact of 1928) to Outlaw War Signed by Great Powers: C-354.
 - E. Hoover's Peace Efforts: H-335.
 - F. Roosevelt's "Good Neighbor" Policy: R-146i.
 - G. Advocate "Quarantine" of Aggressor Nations: W-178c.

II. FOREIGN-TRADE POLICY:

- A. Reciprocal Tariff Act of 1934: R-146i.
- B. Reciprocal Treaties Become National Issue: R-146n.

III. THE QUESTION OF NEUTRALITY:

- A. Experience of United States in First World War: W-167-8, N-75a.
- B. Changes in Neutrality Policy before and after Outbreak of War in 1939: N-75b, R-146p.
- C. Abandonment of "Isolationist" Position: U-251b, W-178m-n.

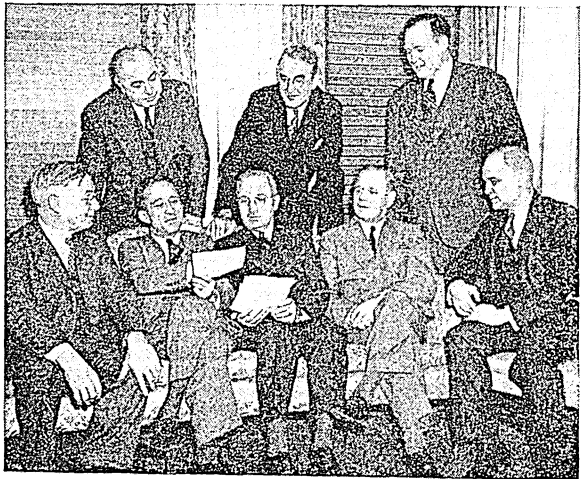
IV. PROBLEM OF NATIONAL DEFENSE:

- A. Policy of Disarmament after First World War: (See Section I).
- B. New Wars in Europe and Asia Bring Change in Favor of Strong Defensive Policy: R-146m.
- C. Objectives of Rearmament Program: W-178m-n.
 - a. "Two-Ocean" Navy: N-51-2, R-146p.
 - b. Army for Hemisphere Defense: R-146n-o.
 - c. Huge New Air Force: W-178n.
- D. New and Strengthened Military and Naval Bases: W-178m-o, P-53, C-84, A-107, N-52-3.
- E. Cooperation among Pan American Nations: R-146n.

V. MEETING THE THREAT OF WAR:

- A. "Arsenal of Democracy": U-251b.
- B. Leasing British Naval Bases: W-178m.
- C. Joint Defense Board with Canada: C-62, R-146n.
- D. Peacetime Conscription Adopted: R-146n.
- E. Huge Appropriations for Increases in Size of Army and Navy: A-307f, N-53.
- F. Administration of the Defense Program: R-146p, U-251b-252.
 - a. Rising Taxes and Increased Debt: R-146o-p.
 - b. Curtailment of Nondefense Production: R-146p.
- G. Lend-Lease Aid to Other Nations: R-146o, W-178o.
- H. Greenland and Iceland Occupied: W-178o, R-146p.
- I. Material Aid to Soviet Russia: R-146p.
- J. Atlantic Conference with Britain: W-179g.
- K. Naval Action against Axis Raiders: R-146p, W-178t.
- L. Amendment of Neutrality Act: R-146p.

THEY CHECKED UP ON ACTIVITIES AT HOME



Democracy at work was well illustrated by this group of men who comprised the Senate defense investigating committee. It was their responsibility to conduct hearings and to probe into the need for, and the conduct of, the various "home-front" war-time activities. Senator Harry S. Truman of Missouri, chairman of the committee, is seated in the middle.

AMERICANS ON THE OFFENSIVE IN THE SOUTH PACIFIC



This battle scene from Tarawa Island shows American Marines during the height of their attack on Japanese positions on the small island in the Gilberts. These men have just established a beachhead and are now going "over the top" of a log barricade in the face of withering fire to storm the enemy airfield. The three-day battle on Tarawa was the toughest fighting in Marine Corps history, and it helped to set in motion a great drive intended to smash the outer rim of Japanese island defenses.

VI. RELATIONS WITH JAPAN:

- A. Early Efforts to Restrain Japanese: W-178n.
- B. Partial Embargo on Japanese Trade: W-178s.
- C. Secretary Hull Proposes a Peaceful Settlement of American-Chinese-Japanese Issues: W-178v.

United States Goes to War

- I. ATTACK BY JAPAN: W-178v.
- A. Germany and Italy Declare War: W-178w.

- B. Latin America Supports U. S. Stand: W-178w.
- C. United Nations Sign Pact in Washington: W-178w.
- D. American Troops on World-Wide Front: W-178x.

II. ENTIRE NATION JOINS IN MIGHTY WAR PROGRAM: N-12c-13.

Note: For further references on American participation in the war consult Reference-Outline on United States in the second World War, W-180.

LATIN AMERICA IN TRANSITION

I. LATIN AMERICA COMMANDS WORLD ATTENTION: L-67a.

- A. Its Rapidly Growing Significance in World Affairs: L-67m, S-206f.
- B. Its Contributions to World Needs: S-206f. Coffee from Brazil B-226d; Wheat and Meat from Argentina A-280b; Nitrate from Chile C-207; Oil from Venezuela, Peru, and Mexico V-276, P-138, M-141.
- C. Importance of Latin American Trade with the United States: S-208, C-133b, L-67m.
- D. The Attraction of Its Undeveloped Resources: S-205a, B-226d, L-67a.
- E. Strategic Position of Latin America in Current World Conflicts: N-51-2, S-205b map.

II. GENERAL CONDITIONS IN LATIN AMERICA:

- A. Varied Racial and Cultural Factors: L-67d, S-205c.
- B. New Spirit of Progress: L-67a.
- C. The Latin American Outlook on Life: L-67c.

III. OBSTACLES TO PROGRESS:

- A. Many Regions Isolated by Mountain Barriers or by Impenetrable Forests: S-205a, L-67m, C-206, A-139.
- B. Extremes of Climate Hamper Human Activity: S-205d picture, L-67d, C-207.
- C. Lack of Transportation and Communication: S-206d-e, A-139, L-67m.
- D. Low Standards of Living among Masses: L-67m.
 - a. Best Land Usually Owned by a Few Wealthy Families: S-206d, C-133a, B-226a, A-279, C-207b, L-67g.
 - b. Primitive Indian Culture Still Dominant in Many Sections: C-133, B-226b, A-139, M-136.
- E. Lack of Purchasing Power Delays Development of Industries: S-205a, P-137.
- F. Prosperity Depends on a Few Large Exports: S-206f-208.

BRAZIL FIGHTS WITH THE ALLIES



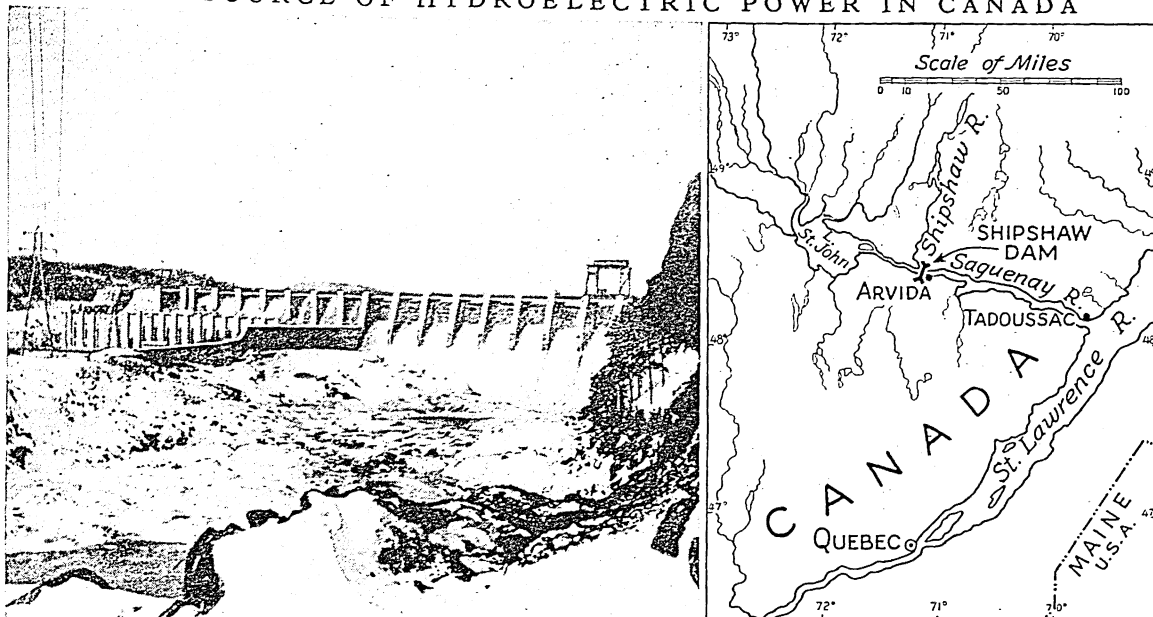
On December 12, 1943, the Allies were cheered by the news that Brazil would soon send troops to fight alongside the Allies against Hitler. Brazil had declared war on the Axis in August 1942, after its people had been aroused by the sinking of their ships by Axis submarines. Brazil's expeditionary force would comprise the first soldiers ever sent overseas from a Latin American republic. Here an American general is shown guiding a group of Brazilian officers on an inspection tour of Italian ruins near Naples.

- G. Natural Resources Often under Foreign Control: L-67m.
- H. Political Confusion in Many of the Republics:
 - a. Lack of Preparation for Democracy: L-67g, C-133d.
 - b. Dictators Frequently Seize Power: S-209, L-67i.
- IV. MOVEMENTS TO SOLVE THESE PROBLEMS:
 - A. The Spread of Education: L-67k-m, C-133a.
 - a. Progress in Argentina, Chile, and Mexico: A-280d, C-208, M-142a.
 - b. Combating Illiteracy: P-141, E-155, C-133a.
 - B. New Literature Stresses Social Problems: L-67t.
 - C. Improving Conditions of Labor: L-67n.
 - D. Efforts to Increase and Diversify Production: L-67n.
 - E. Growth of Domestic Manufacturing: S-208, C-207b, B-226d.
- F. Steps to Control Foreign Capital: L-67n-o.
- G. Breaking Up the Great Landed Estates: L-67n, B-226a, M-140.
- H. Modernizing Transportation:
 - a. Progress in Building Motor Roads: S-206f, C-133c.
 - b. Growing Network of Air Lines: S-206e, L-67m, L-67c picture.
 - c. Building Costly Railroads: S-206e, A-280d, M-142, L-67m.
- V. FOREIGN RELATIONS OF LATIN AMERICA:
 - A. Influence of Old World Powers: L-67a-b.
 - B. Earlier Distrust of "Yankee Imperialism": L-67o.
 - First Pan American Conferences: L-67o.
 - C. Effect of "Good Neighbor" Policy of the United States: L-67o-p.
 - D. Work of Recent Pan American Conferences: L-67p, S-210.
 - Principles of Monroe Doctrine Gain United Support: L-67p-q.
 - E. Export-Import Bank Helps to Stabilize Latin American Finances and Trade: L-67q.
 - F. The Pan American Union and Its Work: L-67q.
 - G. Expropriation of Foreign-Owned Oil Wells by Mexico Opposed by U.S. and British: M-141-2.
 - H. Measures of Solidarity in Second World War: L-67p-q, R-146n.
 - a. Declaration of Panama Sets Up "Zone of Security": L-67p.
 - b. Act of Havana Prevents Aggressor Nations from Gaining Foothold in New World: L-67p-q.
- VI. LATIN AMERICA IN THE WAR: W-178w.
 - A. After Pearl Harbor, Republics of Central America and West Indies Declare War on Axis: W-178w.
 - B. Conference at Rio de Janeiro Confirms Solidarity of New World Republics: W-178w.
 - C. Mexico Declares War on Axis after Its Ships Are Sunk in Home Waters: M-142f.
 - D. Brazil Sends Expeditionary Force to Serve with Allies in Europe: W-179g.
 - E. Argentina Abandons Neutrality by Severing Diplomatic Relations with Germany and Japan: W-179g.

SOCIAL AND ECONOMIC PROBLEMS AND MOVEMENTS

- I. DEMOCRACY IN A CRITICAL PERIOD:
 - A. Requirements for Self-Government: D-47-8.
 - B. Obstacles to Effective Democratic Management:
 - a. Confusion and Political Corruption: D-48-9.
 - b. Examples of Failure from Lack of Preparation for Self-Government: Italy I-158-9; Germany G-74-5; Spain S-231b-d; Poland P-276.
 - C. Spread of Anti-Democratic Theories:
 - a. Fascism and the Doctrine That the People Exist for the Benefit of the State: F-17-18.
 - b. Communism and Theory of Class War: C-324d.
 - c. Dictatorship in Times of Stress: D-67c-d.
- II. PROBLEMS OF A MACHINE AGE: U-251-251b:
 - A. Effects of Industrial Revolution Continue: I-74l-o.
 - B. Economic and Social Consequences of Mass Production: M-10, E-150-1.
 - a. Higher Scale of Living: I-74n.
 - b. Increase of Leisure: L-93a-b.
 - c. Standardization of Goods and Services: M-11.
 - d. Stimulation of Scientific Research: I-75, I-117.
 - e. Concentration of Population in Cities: U-251a, pictograph I-74f.
 - Special Problems of City Life C-240-2.
 - f. Technological Unemployment: M-10, A-386.
 - C. Social Significance of Power Development: P-339.
 - D. Trend toward Decentralization: I-74m.
- III. CHANGES IN STATUS OF LABOR: L-43-5.
 - A. Recognition of the Right to Collective Bargaining: L-44d.
 - B. Standardizing Hours and Wages: L-44d.
 - C. Increase of Arbitration in Labor Disputes: A-247.
 - D. Conflict between Trade Unions (A. F. of L.) and Industrial Unions (C. I. O.): L-44a.
 - E. Trends in Labor Movement Abroad: L-45.

HUGE SOURCE OF HYDROELECTRIC POWER IN CANADA



Wartime need for aluminum compelled the building of the largest hydroelectric power development in Canada on the Saguenay River in the wilds of northern Quebec (see map at right). Called the Shipshaw Dam, it was built to furnish power mainly for the vast Aluminum Company of Canada plant at the near-by town of Arvida. Construction was started in October 1941, and the project was in operation by the end of 1943. Shipshaw is designed to generate 1,200,000 horsepower, or enough electricity to light every home on the North American continent. The dam is about the same size as Boulder Dam in the United States.

IV. PROBLEMS OF THE FARMER: A-56.

- A. Higher Farm Production, Lower Costs: A-49-51.
- B. Farmer's Need for Collective Bargaining: A-56.
—Marketing Associations: C-355a.
- C. Depressed Conditions in Agriculture: A-56b.
- D. The Question of Farm Credit: F-12.
- E. Efforts to Stabilize Farmer's Income: A-56b, U-230.
- F. Tenant Farmers and Share Croppers: C-376.
- G. Raising the Standards of Rural Life: A-55, A-387.
—Work of 4-H Clubs: F-164-5.
- H. Helping the Farmer Plan for the Future: U-228.

V. THE CONSUMER AND HIS INTERESTS:

- A. The Problem of Consumer Coöperatives: C-355a-56.
- B. Arguments for and against Chain Stores: C-137.
- C. Good and Bad Points of Advertising: A-23.
- D. Instalment Selling and Buying: I-93, T-87.
- E. Fight against Fraud: A-24a. Federal Trade Commission F-22; Pure Food Laws P-368d.

VI. GROWING DEMAND FOR SECURITY:

- A. The Problem of Unemployment: R-146l, S-179.
- B. Support of Those Too Old to Work: P-118, S-179.
—Increase in Proportion of Old People: P-304b.
- C. Insuring Health and Comfort: H-370.
 - a. Group Health Insurance: C-344, S-179.
 - b. Problem of Adequate Shelter: S-114, B-265, R-146m picture.
- D. Physical Safety and Accident Prevention: S-2-3.
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- E. Relief of the Destitute: P-302-3.

VII. CONSERVATION MOVEMENT: C-341-46.

- A. New Principles of Soil Management: S-191d.
- B. Right and Wrong Ways of Using Land: L-61.
- C. Measures to Combat Drought: D-113c.

- D. Modern Methods of Flood Control: F-106b-d.
- E. Recent Work in Forest Conservation: F-157-8.
- F. Preventing Pollution of Streams: C-342.
- G. Developing Inland Waterways: R-111.
- H. Preserving Wild Life: C-343.
—How to Attract and Protect Birds: B-141-6.

VIII. NEW MOVEMENTS IN EDUCATION:

- A. Recent Changes in Methods of Instruction: E-184.
- B. New Emphasis on Character Education: C-141-3.
 - a. Study of Personality Development: C-140, C-201.
 - b. Some Principles of Child Training: C-203-204b.
 - c. Purpose and Practise of Good Manners—a New Approach to Etiquette: E-310-13.
- C. Vocational Education and Guidance: V-313-30.
- D. Training in Use of Leisure Time: L-93-93d.
 - a. The Choice of a Hobby: H-313-13n.
 - b. Planning Vacation Activities: V-266a-1.
- E. Modern Approach to Home Economics: H-325-9.
- F. Growing Interest in Detailed Social Backgrounds of American Democracy: Colonial Life A-163-75; Pioneer Life P-221a-1; Far West F-13-17; American Southwest S-221-4; Cattle Ranching C-107-15. (See also new treatment of entire range of United States History U-233-52.)
- G. New Approach to Study of Communication as a Dominating Factor in Modern Life: C-324-324c.
- H. Analysis of Propaganda and Its Influence on Society: C-324b, R-31a.

IX. RELATIONS BETWEEN PEOPLES:

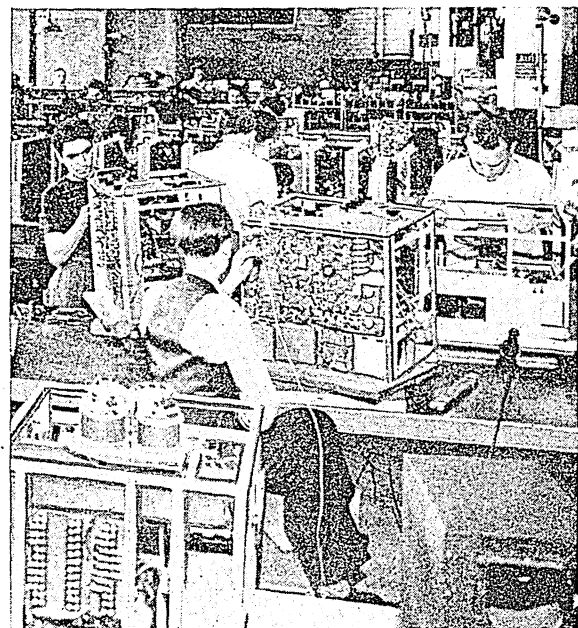
- A. Interdependence or Economic Nationalism: I-111-12.
- B. What Depression Does to World Trade: I-111.
- C. Could the United States Be Self-Sufficient? I-112.
- D. Changes in World's Money Systems: M-221.
- E. Status of International Law: I-108-10.
- F. Hope for Lasting Peace: W-179g-j.

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I. PHYSICAL SCIENCE:

- A. The New Physics: P-194-6.
- B. Studies in the Structure of Matter:
 - a. Smashing the Atom: A-362, P-195.
 - b. X-Rays Reveal Atomic Patterns: X-200, C-409.
- C. Investigating Radiation: R-14.
 - a. Cosmic Ray Research: R-15.
 - b. Discovery of Artificial Radioactivity: R-34.
- D. The New Science of Electronics: E-240-3.
- E. Development of Photoelectric Effects: P-177.
- F. Modern Chemical Research: C-179.
 - a. Theory of Atomic Numbers: A-361, S-244.
 - b. Study of Isotopes: C-169.
 - Discovery of "Heavy Hydrogen" H-368.
- G. Theories of Einstein: E-211-13.
 - a. Application to Gravitation: G-143.
 - b. Matter and Space: A-346.
- H. Progress in Astronomy: A-350.
 - a. Discovery of the New Planet Pluto: P-233.
 - b. Galaxies or Island Universes: A-346, N-60-1.

BUILDING RADAR SETS FOR THE NAVY



These units that look like the inside of radios are radar sets—the radio detectors and range finders that pierce cloud, fog, and darkness to reveal hidden planes and ships in wartime. Radar is likely to have many peacetime uses also, particularly as a safety device on the sea and in the air.

- c. The Study of Novae or Exploding Stars: S-275.
- d. Increase in Power of Telescopes: T-40.

II. METEOROLOGY:

- A. Weather Forecasting by Air-Mass Analysis: W-61-2.
- B. Recent Studies of Climate: C-271.

III. HEALTH AND NUTRITION:

- A. New Vitamin Discoveries: V-310-12, H-372.
- B. Allergy and Food Poisoning: H-373-4.
- C. Some Important Medical Discoveries:
 - a. Gland Therapy and Hormones: G-99.
 - Isolation of Insulin G-100.
 - b. Use of Sulfanilamide and Its Derivatives as Internal Antiseptics: A-222-3.

IV. AGRICULTURAL PROGRESS:

- A. Extraordinary Methods to Control Plant Growth: P-245e.
- B. The Science and Practice of Hydroponics: P-245f-i.
- C. Chemurgy Extends Use of Farm Products: P-245b-c.
- D. Crops for Industrial Use:
 - a. Introduction of Tung Tree: F-19.
 - b. Spread of Demand for Soybean Products: S-224.
 - c. Multiplication of Corn By-Products: C-366b.
- E. Development of Hybrid Corn: C-367.
- F. New Farm Machinery:
 - a. Rust Cotton Picker: I-117, I-116 picture.
 - b. Mechanical Corn Picker: A-54 picture.

V. TRANSPORTATION DEVELOPMENTS:

- A. Principles of Streamlining Applied: A-81.
- B. Improvements in Railroad Service: R-45.
 - a. Streamlined Trains: R-43 picture.
 - b. Diesel-Electric Locomotives: G-22, R-45.
- C. Advances in Design and Use of Airplanes:
 - a. Mechanical Improvement: A-82-5.
 - b. Invention of the Autogiro: A-86.
 - c. Safety in the Air: New Instruments and Use of Radio Beacons A-76-8.
 - d. Record Flights in Recent Years: A-71-4.
- D. Automobile Progress: A-393-407.
 - a. Development of Anti-Knock Gasoline: P-150.
 - b. Growth of Bus and Truck Traffic: A-387-8.
- E. Highway Improvement: R-114-16, A-393 picture.
- F. Extension of Canals and Waterways: C-69, R-111.
- G. Recent Bridge-Building: B-240a-b.
- H. Modern Shipbuilding: S-128, N-12h, N-12i picture.
- I. Progress in Navigation: N-46-9, G-192.

VI. COMMUNICATION ADVANCES: C-324a-b.

- A. Technical Progress in Radio: R-25-8.
 - Importance of Frequency Modulation: R-28a.
- B. Prodigious Development of Broadcasting: R-28-31.
- C. Experiments with Television: T-41-2.
- D. Transmitting Pictures by Wire and Radio: T-42.
- E. Radar and Other Short-Wave Uses: R-24-5.

VII. INDUSTRIAL ARTS:

- A. Creation of Synthetic Materials: C-179-80.
- B. The New Plastic Industries: P-245i.
 - a. Artificial Fibers: R-53-5, W-145.
 - b. Synthetic Rubber and Leather: R-169a-b, L-85.
 - c. Hydrogenation of Coal: P-149-50.
- C. Progress in Metal Industries: M-125.
 - a. Making New Alloys: A-133.
 - b. Added Uses for Aluminum: A-138-9.
 - c. Development of Continuous Rolling Mill for Sheet Steel: I-145-6 pictures.
- D. New Methods of Petroleum Refining: P-150.
- E. Development of Fluorescent Lighting: E-235.
- F. The New Industry of Air Conditioning: H-266.

VIII. MISCELLANEOUS TECHNIQUES:

- A. Development of Color Science: C-308a-j.
- B. Progress in Photography: P-185-6.
- C. Motion-Picture Techniques: Sound Pictures M-290; Technicolor M-278; Animated Cartoons M-284.
- D. Photoelectric Devices: P-177-9.
- E. Automatic Machinery and Controls: A-384-6.
- F. New Instruments of Research: Ultra-Centrifuge C-134; Electron Microscope M-156b.

HITLER, ADOLF (born 1889). One of the strangest chapters in recent history is the rise of Adolf Hitler from common workman to the position of chancellor and dictator of Germany.

The "Fuehrer" ("leader"), as he liked to be called, was born in Braunau-am-Inn, Austria, the son of Alois Hitler, an Austrian customs official, and Klara Poelz Hitler, a Bohemian. The details of Hitler's early life are scanty. His autobiography, 'Mein Kampf', tells almost nothing about it. He spent his childhood in Lambach, Austria, and went to Vienna when 14 to get a job as builder's helper. He was left an orphan at 18.

According to his half-brother, Alois Hitler, young Adolf was studious, bookish, shy, sensitive, nervous, and ambitious to become a painter or architect. His mother helped him obtain training in water-color painting. His father, a severe, blunt man, wanted his son to become a government official, like himself, but Hitler, in 'Mein Kampf', wrote: "I did not want to become an official. . . I hated and was bored by the idea of having to sit tied to an office, of not being master of my own time, of spending the whole of my life filling up forms."

In Vienna Adolf kept himself alive by sweeping streets, Alois says; and his hardships awakened his mind to social and political problems. Austria was a country of many races, and Hitler, feeling himself a thorough German, looked longingly across the border at the powerful, energetic German nation.

"Did not we boys already know that this Austrian State had and could have no love for us Germans?" he explained in 'Mein Kampf'. "I was convinced that the State was sure to check and obstruct every really great German and to support every man and every thing that was un-German. I hated the mixture of races displayed in the capital. I hated the motley collection of Czechs, Poles, Hungarians, Ruthenians, Serbs, Croats, and above all that ever-present fungoid growth—Jews and again Jews. . . From being a feeble world-citizen, I became a fanatical anti-Semite."

Driven by poverty until he thought of it as "a poisonous snake," imbued with a fanatic sense of his German nationality, and deeply prejudiced against Jews, Hitler already carried in his mind the seeds of his later political doctrines, when he left Vienna for Munich in 1912. In Munich he worked as carpenter, architect's draftsman, and water-color painter. There the war found him.

He enlisted as a private August 3, 1914. He served on the Somme, was made Lance Corporal, and won the Iron Cross for the perilous service of acting as runner between the front line and regimental headquarters. He was twice wounded, gassed, and temporarily blinded. When he returned to a much-changed Munich, he joined the German Workers' Party, and

his gifts as orator soon made him a popular leader.

In 1920 he designed the swastika (hooked cross) flag as the party emblem and organized the "Storm Troops" to prevent any interference with his meetings by his enemies, the Communists. The name of the Party was changed to National Socialist German Workers' Party (*Nationalsozialistische Deutsche Arbeiterpartei*), abbreviated to "Nazi" (*nö'ts'i*). The Nazis gained ground so fast that on Nov. 8, 1923, aided by General Ludendorff and his Nationalist followers, they attempted to gain control of the government by the "Beer Hall Putsch," so called because this unsuccessful revolt was touched off by Hitler in a Munich beer hall. Hitler was arrested and sentenced to five years in the fortress of Landsberg am Lech. There he wrote 'Mein Kampf', now regarded as the "bible" of the Nazis. He was released eight months later.

The years from 1924 to 1928 were prosperous for Germany, and revolutions seldom flourish on prosperity. But with the depression the Nazis' chance came. Hitler himself, having

smarted at German defeat in the war and gone hungry in poverty, was in the closest touch with German thought and feeling, and his oratorical powers enabled him to play skilfully on the emotions of the masses. How he led his party to power and established a régime based on his theories is told in the article on Germany. The program of territorial expansion that finally plunged his country into war is described in the articles Europe and World War, Second.

HITTITES (*hit'tits*). Four thousand years ago the warrior Hittites of Asia Minor rose to world power. For more than a thousand years they ruled most of the region included in modern Turkey and Syria. Their empire rivaled in size and strength the two other world powers of the time, Egypt and the Assyro-Babylonian empires of Mesopotamia.

About a thousand years before our era their empire fell and their civilization passed into oblivion. Only their name remained, kept in man's memory by scattered references in the Old Testament.

The story of the Hittites, nearly all that we know of it, has been recovered within a single lifetime. Most of it has been pieced together since the World War. Our chief source of information is the royal library of 10,000 clay tablets discovered in 1906 and



ADOLF HITLER



The Hittite had a hooked nose and a sloping forehead, like the modern Armenian. This carving is from a gate of the old Hittite capital.

later, in the ruins of the ancient Hittite capital Khattushash, near Bogaz Koi in Turkey, about 90 miles east of Ankara.

These tablets are in cuneiform writing, and most of them, though in Babylonian spelling, are in the Hittite language. For years Hugo Winckler, the German archeologist who made the find, and other scholars labored vainly to get a clue to this unknown tongue. One day an Austrian professor, Friedrich Hrozný, found, in the same sentence with the Babylonian word-sign for bread, the Hittite word "wadar" spelled out. He thought this might be the same as our "water." Other words seemed to have the same roots as the Latin *aqua* (water), and our word

PERFUME JAR



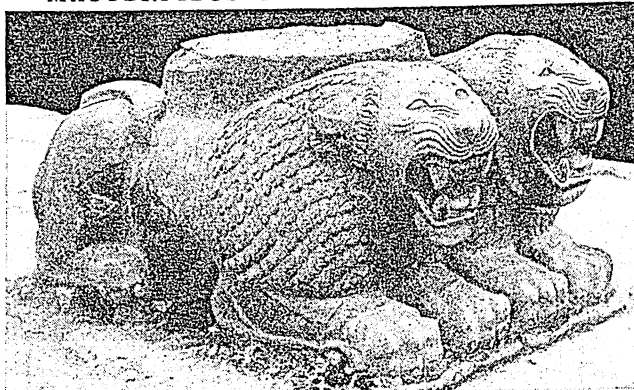
The Hittites were skilful potters. Notice how the lid is fastened to the handle.

horse and chariot and good bronze daggers. They found it easy to conquer the farmers and herdsmen of Asia Minor, who were skilled only in the arts of peace and had no means of transport faster or more powerful than the donkey. It was almost 2000 B.C., however, before the Hittite dominions were united into an empire by a king named Labarna. A later king pushed the Hittite power into Syria and Mesopotamia. This empire lasted until 1650 B.C. A still more powerful one arose in 1450.

If the basis of the old empire had been the horse, that of the new was iron. The Hittites appear to have been the first to use iron. For a time their mines on the Black Sea represented the world supply.

Later the Hittite domain broke up into city kingdoms (1050-850 B.C.), and these finally collapsed before the Achæans, who came in a new wave of Indo-European

MASTERPIECE OF HITTITE SCULPTURE



These superb lions, carved into the base of a pillar, were dug up near Antioch. In ancient times lions were plentiful in Syria.

"eat." Working from these slight clues, by 1915 he was able to announce that he had solved the riddle, and that Hittite is an Indo-European language, related to our own. But the translation of the tablets took another ten years.

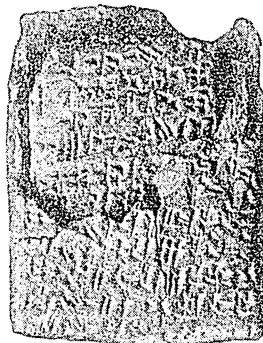
From these and other documents, and from the remains of their great fortified cities, we now know that the Hittites were wild tribesmen when, not long after 3000 B.C., they swept down from the north with

turned up like a ski, were invented for use in snowy mountain passes. Loom weights and spindle whorls found in great numbers show that they manufactured cloth. Beautiful cups, jars, and pitchers indicate their interest in graceful and original forms and in convenient contrivances. The Hittites were also famous workers in metals. Their business methods were Babylonian, and for buying and selling they too used the weighed pieces of silver from which the Greeks got the idea for coins. Caravan routes led from town to town. Big game abounded, and hunting was the sport of king and commoner.

The Hittite state was a military organization. Daily life was closely regulated by law. The price of plowed field and vineyard, of cattle and their hides, was fixed. So were the wages of free man and slave. Punishments were mild, but crimes such as murder and theft were made prohibitively expensive by heavy fines.

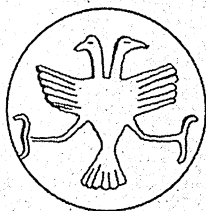
The Hittite contributed to Western civilization by acting as middleman for the older cultures of the East. He passed on to the Greeks ideas which influenced their art, their religion, and their business. His mines supplied the iron which put new implements in the hands of the Mediterranean peoples and brought the Bronze Age to a close. Above all, he contributed by holding with a firm hand the bridge between Asia and Europe while Western culture was in its early stages. Asiatic despots might have throttled European civilization in its infancy, had it not been for that thousand years of Hittite supremacy in Asia Minor.

SECRET NOTE



The Hittites sealed their clay documents in clay envelopes. This one was a slave contract.

EAGLE SEAL



This two-headed eagle was a Hittite religious symbol. The famous Austrian eagle is said to have been derived from this symbol seen on Syrian temples during the Crusades.

The CHOICE of a HOBBY

*Ship Models—Sailing—Aviation—Stamps—Games—Fishing—Riding—Wild Life
Camping—Pets—Photography—Amateur Science—Microscopes—Radio
Handicrafts—Cooking—Magic—Music—Art—and Many Others*

HOBBIES. "Choosing is creating." These three words of the old Persian philosopher hold the secret of the wise and continuous use of this list of books. Here is no stereotyped standardized guide but a springboard for personal adventure.

Significant words and creative ideas can always be trusted to make their own way in the world. Let no one then presume to choose for another the hobby he shall ride, whether for a season or a lifetime. Let the adviser merely stand by with the fruits of such experience as he may find to his liking or his need.

The power to make up one's own mind independently, to act quickly and with sound judgment in an emergency grows by exercise, nourishing food, sunshine and cloud, rain or snow, no less surely and far more rapidly than does the physical body. This necessity constitutes the chief reason for making a wide-ranging choice of the up-to-date books listed under the title, *The Choice of a Hobby*.

"I quarrel with no man's hobby," said Sir Walter Scott to his contemporaries and more than once does he speak of "the pleasure of being allowed to ride one's hobby in peace and quiet."

That hobby-riding is no modern sport we do well to remember in this day and age. "I never pretend to be above having and indulging a Hobby Horse," confided Madame d'Arblay to her Diary in 1768.

George Washington was confiding to his diary at about the same time, but in more matter-of-fact terms, the hobbies he delighted to ride; and until we learned what Washington really liked to do in his spare time most of us never found his life very interesting to read. Being a general, a president, or a ruler of the people has its strict limitations of time and place. But having a strong spontaneous interest in a subject of perennial living interest, as Benjamin Franklin had in electricity, as Theodore Roosevelt had in birds and animals, as Franklin Roosevelt has had since boyhood in ships and sailing and in stamp collecting,

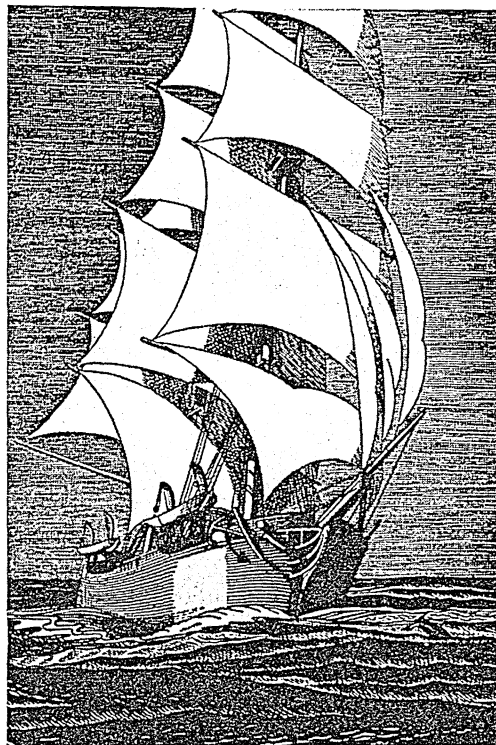
gives a man his own place in the memory of any boy or girl holding similar interests.

"I have a hobby of making things in wood," an eleven-year-old boy confided to me recently in one of the branches of the New York Public Library. "I've made two sailboats from the plans in this book and sailed them on the lake in Central Park. I've made a marionette stage too. My father has given me a room in an old office building he owns and I keep all my lumber there and go down to work every Saturday. I just love to work down there."

"When I want to make anything I take it out of my mind," was the reply given by a ten-year-old boy in Maine, when asked if he had a book to show him how to build the things he wanted to make. For this boy one end of the long living-room of an old Maine farm house had been partitioned off to make a shop with direct access from the kitchen. Here the things he takes out of his mind lie undisturbed and unsupervised during the period of creative construction. On his bedroom table lies his favorite book of the moment, Kenneth Grahame's *'The Wind in the Willows'*, chosen not from a list of recommended books but from Ernest Shepard's drawings and his mother's reading

aloud from it. "I like to read the funny parts all over again myself," he said.

With the desire to make this list as richly suggestive and as widely useful as possible, specialists at the Book Shop for Boys and Girls, the Boston Public Library, the Los Angeles Public Library, the New York Public Library, the Children's Bookshop, the Children's Library at Westbury, Long Island, and many other sources were consulted. John Mulholland, the magician, formerly instructor in shop work at the Horace Mann School for Boys, was asked for advice concerning the books on Magic and Magicians. Edwin T. Hamilton, a former aviator and author of books on Building and Handicrafts, was helpful in the selection of the books relating to those subjects. Will Cuppy



A Sailing Ship, by Rockwell Kent, drawn for Herman Melville's *'Moby Dick'* (Random House).

made lively and discriminating comment on the books about Birds, Fishes, Butterflies and Bugs, Astronomy, and the Seashore. Ralph P. Terrill, whose descriptive notes are quoted under the initials *R. P. T.*, gave valuable assistance in the selection of books relating to Sports. Mr. Terrill's first-hand knowledge of books in the field in which he has specialized is unique, and a boy or girl with definite interest in a particular sport will find his suggestions very much to the point.

The making of such a list stirred in the writer thrilling memories of long personal acquaintance with Dr. William T. Hornaday, who established and for many years directed the New York Zoological Park and who has always been an ardent defender of the rights of wild animals to a life of their own; with Daniel Carter Beard, familiarly known as Dan Beard, the pioneer Scout, who told bear stories in the Children's Room of the Pratt Institute Free Library one night at the turn of the century to a hundred boys, every one of whom had made something from the direction given in his 'American Boy's Handy Book'; with Ernest Thompson Seton whose contributions to woodcraft, wild animal lore, and story telling 'round the camp fire gave fresh ideas and new forms to out-of-doors life for boys and girls in the early years of the twentieth century.

And it becomes a continuing source of inspiration to know the younger men and women who are making the world a wider, a richer, and a better place to live in for the boys and girls of today to whom this list is dedicated with the hope that they will impart to it in their turn and in their way the fruits of their own experience with books and with the life of which books are the record.

From boys and girls and from librarians and specialists over the United States have come many admirable suggestions for the revised list which is now included in the Encyclopedia.

Since it is impossible in a limited space to list under individual title the many excellent bulletins and pamphlets relating to animals, birds, wild flowers, trees and other subjects which are issued by State and Federal governments, it is suggested that readers who desire more material on any subject consult the librarians of local public or school libraries concerning available resources in pamphlet form. The Merit Badge pamphlets issued by the Boy Scouts of America, the Leisure League pamphlets on such subjects as Photography and Tropical Fish, the Manual of Ship Model Making issued by Popular Science Monthly, are among those mentioned by librarians who make frequent use of them.

Ships and Sailing

The History of American Sailing Ships. By Howard I. Chapelle. Illustrated by George C. Wales, Henry Rush, and the author with 150 plans, line drawings, and photographs. (Norton, 1935.) The first complete history of the development of the various types of sailing vessels in America from the earliest Colonial craft down to and including modern racing and cruising yachts. Includes chapters on Naval Ships, Privateers and Slavers, Revenue Cutters, Schooners,

Merchant Vessels. The true story of American ships and the men who built and sailed them, characterized by Lincoln Colcord as "of permanent historical value."

The Story of the Ship. Illustrated by Gordon Grant. (McLoughlin, 1919.) The history of ships told in a series of authentic drawings of ships in color and in black and white. Brief informative text accompanies each picture. Appeals to children of picture-book age and also to older boys and girls.

Tramps and Liners. By T. W. Van Metre. (Doubleday, 1931.) Accurate, complete, interesting information on modern ships. Very popular with boys.

Sailing, Seamanship, and Yacht Construction. By Uffa Fox. (Scribner, 1935.) Theory and practise of all kinds of sailing, from control cruising to racing, from "frost-bite" dinghy to *Britannia*. Illustrated with many photographs and drawings.

Sailing. Edited with an introduction by A. Courtauld. (Oxford, 1935.) Deep watermen, coasters, fishermen, yachts.

Learning to Sail. By H. A. Calahan. (Macmillan, 1938.) A revised edition of a practical handbook for those who sail small boats. Deals with selection and care of sails and hull, rules of road, piloting, handling the boat, etc.

Learning to Race. By H. A. Calahan. (Macmillan, 1937.) A book for the beginner which presupposes knowledge of sailing. Aerodynamics, tactics, and strategy are carefully covered.

Learning to Cruise. By H. A. Calahan. (Macmillan, 1937.) Covers requisites of a cruiser, rigging, types of cruising craft, power, lights, sleeping quarters, food, equipment, safety, navigation, night sailing, etc. Assumes knowledge of sailing and motor boating.

Yacht Racing. By Manfred Curry. (Scribner, 1930.) A new revised edition of Dr. Curry's authoritative book dealing with the aerodynamics of sails and racing tactics. Very fully illustrated with photographs, diagrams, and charts. The most modern and successful treatment of yacht racing. For boys and girls experienced in sailing.

Yachts Under Sail. Foreword by Alfred F. Loomis. (Morrow, 1933.) Sailing craft from "frost-bite" dinghies to cup defenders are included among the many beautiful photographs which compose this book.

Sailors' Knots. By Cyrus L. Day. (Dodd, 1935.) "A grand book on cordage and splicing. Over 150 knots are illustrated in a fine series of photographs showing the various stages of tying."—*R. P. T.*

The A B C of Yacht Design. By Charles G. Davis. (Rudder, 1930.) A simple treatise for beginners covering all the principles of yacht design.

Small Boat Building. By Edwin Monk. (Scribner, 1934.) For the amateur, with 16 modern small boat designs. Rowboats, sailboats, outboards, hydroplanes, and a runabout. Construction and detail fully considered in the text and diagrams by a naval architect.

The Ship's Husband. By H. A. Calahan. (Macmillan, 1937.) An informative guide to yachtsmen on the care of their craft.

Sailing Made Easy. By Rufus G. Smith. Photographs by Walter Civardi. (Kennedy, 1938.) An all-picture book on sailing with clear reliable captions leading step by step from the first day in a sail boat.

Ship Model Building

Build a Winning Model Yacht. By Thomas Moore. (Stokes, 1928.) Gives complete, detailed information. "Of all books used on the subject, this is the one that the boys actually buy," is the comment of the leader of a group of boys who have been building models for two years.

Miniature Racing Yachts. By Thomas Darling. (Scribner, 1936.) Every step in yacht building is fully illustrated with scale diagrams, plans, and tables. Numerous photographs of completed models in their element add life and variety.

Junior Boat Builder. By H. H. Gilmore. (Macmillan, 1938.) Practical adventures in boatbuilding with illustrations and drawings by the author.

Ship Model Making. By Capt. E. Armitage McCann. 3 vols. (Henley, 1926-27.) Good for making display models. Information simple and complete. Best book for beginners making old-time models. Each volume devoted to a different type. Vol. I—How to Make Worth While Models of Decorative Ships. Vol. II—American Clipper Ship. Vol. III—The U. S. Frigate *Constitution*.

Aviation

Beauty of Flight. By Manfred Curry. (Day, 1933.) A thrilling series of 100 photographic illustrations of planes and gliders in flight; chosen from European and American collections. In an introductory chapter relating to "cloudland," Dr. Curry combines scientific data relating to cloud form with the beauties of flying. A book for all ages.

Sky High. By Eric Hodgins and F. Alexander Magoun. Revised edition. (Little, 1935.) A history of aviation from its beginning 150 years ago. Includes records of stratosphere exploration, achievements in endurance flying, refueling and flying the mail. Graphically told and with illustrations from old prints and modern photographs.

Skycraft. By Augustus Post. (Oxford, 1933.) Aircraft construction and control clearly set forth for boys by a well-known pioneer in aviation. Fully illustrated and accompanied by a glossary of aeronautical terms.

Book of Gliders. By Edwin W. Teale. Illustrated. (Dutton, 1930.) Flying without motors has a fascination of its own. This book tells how to launch and fly a glider and also how to build one.

Wings of Tomorrow. By Juan de la Cierva. (Harcourt, 1931.) The true story of the autogiro told by its inventor who tells of boyhood experiences in Spain which led to the building of "the windmill plane."

Complete Model Aircraft Manual. By Edwin T. Hamilton. Illustrated. (Dodd, Mead, 1938.) An invaluable book for the boy who has never built a model airplane and may wish to progress from the simpler to the more complex. Plans for 85 models are given. A complete aviation dictionary, a glossary of model terms, dealers' list, and model pilot's log are also included. The author is an experienced aviator.

Your Wings. By Assen Jordanoff. Drawings by Frank Carlson. (Funk, 1937.) Principles of flying clearly set forth in a comprehensive book which includes chapters on electricity, variable-pitch propellers, instrument flying, and other basic topics.

Heroes of the Air. By C. Fraser. Revised edition. (Crowell, 1938.) Valuable for chronology, 1903-1937, and for separate stories of epochal flights.

Flying for 1938. By Howard Mingos. (Aeronautical Chamber of Commerce.) Selected from 'Aircraft Year Book for 1938', which is the official record and reference work on American aviation and contains aviation chronology and records for 1937. Published annually.

Stamp Collecting

Scott's Standard Postage Stamp Catalogue. Edited by John N. Luff and Hugh M. Clark. (Scott, 1938.) Illustrates and describes every government-issued postage stamp in the world. A new edition is published every year. All stamps are sold or traded on the basis of "catalogue price." Indispensable to the collector.

How to Build a Stamp Collection. By Prescott Holden Thorp. (Burt, 1935.) An informative little book which gives specific directions for mounting and caring for a stamp collection. For older boys.

The Young Stamp Collector's Own Book. By Ellis Parker Butler. Illustrated. (Bobbs, 1933.) A delightful book designed for boys from eight years old to high school age. Contains a valuable introduction for parents and a section called "Where Is It?" for the identification and location of stamp countries.

Stamp Collecting. By Stanley Phillips. New and enlarged edition. (Dodd, 1936.) An excellent general work on stamps by an English authority. For the experienced collector rather than the beginner.



The Model Maker, drawn by Gordon Grant for his book, 'Sail Ho! Windjammer Sketches Alow and Aloft' (Payson).

The Stamp Collectors' Round Table. Edited by Foster W. Loso. (Stokes, 1937.) Thirty-two expert collectors share the fruits of their experience in various fields of specialization. Profusely illustrated.

Standard Catalogue of Air Post Stamps. Compiled and edited by Nicolas Sanabria and H. M. Konwiser. (Nicolas Sanabria, Inc., 1938.)

The United States Postage Stamps of the Twentieth Century. Vol. IV, Commemoratives. By Max G. Juhl. (H. L. Lindquist, 1938.) Authoritative information effectively illustrated.

Commemorative Stamps of the World. By P. H. Thorp. (Scott, 1934.) The best book on the subject as yet published. Fully illustrated with stamps picturing historical events and persons.

The Beginner's Book of Stamp Collecting. By Stanley Phillips. (Dodd, 1934.) The reader, assumed to have been given a parcel of mixed stamps, is helped by the author to arrange them. Stamp terms explained. Chapter on School Stamp Clubs. Full-page plates of stamps.

Coins

Coin Collecting. By Joseph Coffin. (Coward, 1938.) A guidebook for the beginner which is interesting reading. Contains a glossary of terms, a list of dealers, and a bibliography of books and periodicals dealing with numismatics.

Standard Catalogue of United States Coin and Currency. Edited by Wayte Raymond. (Scott, 1938.) From 1652 to the present day. Gives prices.

Swimming

The Diving and Swimming Book. By G. H. Corsan. (Barnes, 1924.) The many pictures are clear and alive. The text although addressed to teachers of swimming serves boys and girls admirably.

Swimming and Plain Diving. By Ann Avery Smith. (Scribner, 1930.) The fully illustrated concise text makes this a practical guide for those who can swim as well as a reliable manual for teachers. The author is the director of swimming in the Department of Physical Education for Women of the University of Illinois.

Swimming and Watermanship. By L. deB. Handley. (Macmillan, 1918.) Swimming, diving, water polo, life saving are treated by the coach of the 1932 American Women's Olympic winners.

Swimming the American Crawl. By Johnny Weissmuller. (Houghton Mifflin, 1930.) "Contains elementary instruction and exercises for the beginner and also furnishes valuable material for the finished competitor."—R. P. T.

Water Pageants, Games and Stunts. By Olive McCormick. (Barnes, 1933.) "The first complete book on water pageants by a nationally known authority. Seven complete pageants described in detail and directions given for costumes, scenery, etc. Fine chapters on swimming formations, dives and stunts."—R. P. T.

Swimming Analyzed. By Gertrude Goss. (Barnes, 1935.) Methods of teaching swimming enlivened with games and stunts. Chapter on Care and Sanitation of Swimming Pools.

Skating

The Art of Skating. By Irving Brokaw. (American Sports, 1928.) "A complete authentic guide to skating from the first strokes to the most intricate of the modern skating figures. Chapters on championships, carnivals, hockey and speed skating. Profusely illustrated."—R. P. T.

Modern Figure Skating. By T. D. Richardson. (Methuen, 1930.) An excellent illustrated guide to modern skating technique.

Ice Hockey. By A. Sayles and G. Hallock. (Barnes, 1931.) A practical textbook on modern ice hockey written by the coach of the Williams College team and the captain of the St. Nicholas hockey team of New York.

Beauty of Skating. (Scribner, 1935.) A book of very beautiful photographs, with an introduction by Dr. Manfred Curry.

Skiing

The Art of Skiing. By Charles N. Proctor. (Harcourt, 1933.) An illustrated manual of skiing covering all phases of American technique. Excellent for the beginner in its thorough treatment of equipment and fundamentals.

The Complete Ski-Runner. By Arnold Lunn. (Scribner, 1930.) "One of the best books on skiing in print. Finely illustrated and a more exhaustive treatment."—R. P. T.

Modern Ski Technique. By O. Schniebs and J. W. McCrillis. (Stephen Daye, Brattleboro, Vt., 1937.) Recent developments in skiing.

The Wonders of Skiing. By Hannes Schneider and Arnold Fanck. Translated from the German by George Galloway. (Scribner, 1937.) A comprehensive book for all enthusiastic skiers. Illustrated with 242 photographs and 1,100 cinema reproductions of almost every movement.

Archery

Modern Archery. By Arthur W. Lambert, Jr. (Barnes, 1929.) An excellent book on accurate target shooting. Used with success by camp leaders.

Archery. By Robert P. Elmer. (Penn, 1933.) A new and revised edition of a standard work by the foremost authority in the country. Contains also a history of the sport with all American records.

Fencing

The Book of Fencing. By Eleanor B. Cass. (Lothrop, 1930.) Contains the secrets of fencing and is an interestingly written story of the development of present standards.

The Theory of Fencing. By J. Martinez Castello. (Humphries, 1931.) Written by the coach of the 1924 American Olympic Fencing Team. Fundamental positions, guards, parries, and general technique carefully explained.

The Art of the Foil. By Luigi Barbasetti. (Dutton, 1935.) "Contains a complete and authoritative presentation of the theory and technique of fencing with a foil, with a short history of fencing."—R. P. T.

Games

The Art of Badminton. By Sir George Thomas. (Hutchinson, 1931.) A well-written guide to a game which is growing in popularity.

Modern Ping-Pong and How to Play It. By Coleman Clark. (Day, 1933.) Contains laws as amended in 1933.

Deck Sports. By M. H. Feddersen. (Hale, 1933.) A complete manual of sports, games and entertainments on ship-board. Rules for shuffleboard, deck golf, badminton, deck tennis, etc.

Chess and Checkers. By Edward Lasker. (Appleton, 1938.) Complete instruction for the beginner. General principles of strategy are developed in the treatment of checkers. This book was first published in 1918.

Secret Writing. By Henry Lysing. (David Kemp, 1936.) An introduction to cryptograms, ciphers, and codes.

Fishing

Just Fishing. By Ray Bergman. (Penn, 1932.) "Covers all the Eastern fresh-water game fish with particularly fine chapters on trout, bass, pike, and pickerel fishing, land-locked salmon, lake trout. The author is an expert and the book is extremely well written."—R. P. T.

Hewitt's Handbook of Fly Fishing. By E. R. Hewitt. (Marchbanks Press, 1933.) A practical guide book for the beginner who wants to go trout fishing.

Black Bass and Bass Craft. By Sheridan R. Jones. (Macmillan, 1930.) "Haunts, habits and different varieties of bass; lures, casting, playing from the reel, natural foods. All based on this author's personal experience."—R. P. T.

Book of the Black Bass. By James A. Henshall. (Appleton-Century, 1881.) "The classic of all bass fishing literature."—R. P. T.

Secrets of the Salmon. By Edward R. Hewitt. (Scribner, 1925.) "Tackle, casting, wet-fly fishing, dry-fly fishing, nymph-fly fishing, drag and dropper flies, still-water fishing, salmon breaking water, life history and habits. Belongs in every salmon fisher's library."—R. P. T.

Any Luck? By Eugene V. Connett. (Windward House, 1933.) Part I consists of the things any experienced fly fisherman should have definite opinions on, such as tackle, casting, stream tactics, etc. Part II covers the imponderables of trout fishing, such as the instincts of trout and other things about which one cannot do more than express opinions based upon observation. Part III consists of a group of reminiscences on fishing here and in England.

Golf

A New Way to Better Golf. By Alex J. Morrison. (Simon and Schuster, 1932.) "Concentrate on the correct swing, forget the don'ts, and your game will improve appreciably" is the system advocated.

Standard Golf Instruction. By Seymour Dunn. (Seymour Dunn, 1935.) "The success of the author's schools in New York and Lake Placid is ample proof of the soundness of his methods. His 'Golf Fundamentals' is profusely illustrated by movie stills and photographs."—R. P. T.

Picture Analysis of Golf Strokes. By James M. Barnes. (Lippincott, 1919.) "The author provides a clear text picture coupled with photographs of every conceivable golfing shot."—R. P. T.

Tennis

Lessons for Beginners. By J. Parmly Paret. (Macmillan, 1926.) Teaches all strokes of the game. 'Mechanics of the Game' is the title of the second volume of 'The Lawn Tennis Library', a standard guide.

Lacoste on Tennis. By René Lacoste. (Morrow, 1928.) Tilden says of this book, "Lacoste knows more about how to play the leading tennis stars than anyone living."

Tennis. By Helen Wills Moody. (Scribner, 1928.) Illustrated by the author at the time she was leading the women tennis players of the world. Contains sound advice written with enthusiasm and simplicity. Records her personal experience in tournament matches.

Modern Tennis. By Helen Jacobs. (Bobbs, 1933.) A book by a well-known player.

How to Play Tennis. By Mercer Beasley. (Doubleday, 1933.) "The fundamentals of modern tennis on which one may build his own game. A complete manual for the beginner with rules of the game."—R. P. T.

Track and Field Sports

Modern Athletics. By Lawson Robertson. (Scribner, 1932.) "A new book on training for all track and field events by one of the best known trainers."—R. P. T.

Track and Field. By Charles W. Paddock. (Barnes, 1933.) "A very complete book on track and field sports. Contains new material for training in events measured by the metric system. Ruled pages for school or college and new world records."—R. P. T.

The Fastest Human. By Charles W. Paddock. (Nelson, 1932.) A popular book with boys of high school age.

"Pop" Warner's Book for Boys. By G. S. Warner. (McBride, 1934.) Contains chapters on Baseball, Football, Track and Field Athletics, and Basketball. A recent and popular book for younger boys.

Baseball

Baseball, Individual Play and Team Play in Detail. By W. J. Clarke and Frederick T. Dawson. (Scribner, 1915.) Two well-known coaches tell how baseball first originated in America and consider the whole subject.

Fundamentals of Baseball. By Charles D. Wardlaw. (Scribner, 1924.) Chapters on throwing, pitching, catching, batting, base-sliding, coaching by an experienced teacher.

Babe Ruth's Own Book of Baseball. By George H. Ruth. (Burt, 1929.)

How to Play Better Baseball. By R. H. Barbour and La Mar Sarra. (Appleton-Century, 1935.) Baseball offense, baseball defense, and the team. Material explicit and well organized.

Football

Practical Football. By Herbert O. Crisler and E. E. Wieman. (Whittlesey House, 1934.) For coaches and players. Backfield play, line play, kicking, strategy, etc.

Kicking the American Football. By Leroy N. Mills. (Putnam, 1932.) "George Trevor, football editor of the New York Sun, states that Mills is the greatest kicking coach

of all time. His system is here given in simple form."—R. P. T.

Football Line Play. By Bernard F. Oakes. (Barnes, 1933.) "A textbook on modern line play for coaches and players. Profusely illustrated."—R. P. T.

Football Plays for Boys. By Ralph H. Barbour and La Mar Sarra. (Appleton-Century, 1933.) Descriptions and charts of about 50 plays.

Football Conditioning. By H. C. Langmack. (Barnes, 1926.) "Strongly recommended by the late Knute Rockne."—R. P. T.

Soccer for Junior and Senior High Schools. By John E. Caswell. (Barnes, 1933.) An accurate, instructive book on a popular sport. Novel games and relays, digests of rules, kicking, passing, trapping, tackling, etc.

Lou Little's Football. By Lou Little. (Harcourt, 1934.) "A terse book covering all departments of the game by the coach of Columbia University. For coaches and players alike."—R. P. T.



Sketch of Miss Suzanne Lenglen, famous French tennis player, made during an international match by Helen Wills Moody for her book, 'Tennis' (Scribner).

How to Watch Football. By Lou Little. With the collaboration of Robert Harron. (Whittlesey House, 1935.) The reader watches a typical college football game with the coach of Columbia University. Completely and satisfactorily illustrated.

Basketball

Winning Basketball. By Nathan Holman. (Scribner, 1932.) All features of training and play are presented by one of the best-known coaches and players of this game.

Basketball for Women. By Alice W. Frymir. (Barnes, 1928.) How to coach and how to play the game.

Better Basketball, Technique, Tactics and Tales. By Forrest C. Allen. (Whittlesey House, 1937.) Of special value to high-school and junior high-school coaches. Diagrams and photographs.

Boxing and Wrestling

Modern Boxing. By Len Harvey. (M. S. Mill.) Effective motion pictures with clear instructive text.

Wrestling. By Percy Longhurst. (M. S. Mill.) A companion book which is also illustrated with motion pictures.

Polo

Introduction to Polo. By "Marco." (Scribner, 1931.) Profusely illustrated and covers everything from choice of stick to fine points of match play. Introduction by Lord Wodehouse.

As to Polo. By W. Cameron Forbes. (Baker Taylor, 1927.) "Fifth edition. Sound tactics and play written from long experience and observation."—*R. P. T.*

Position and Team Play in Polo. By W. B. Devereux. (Baker Taylor, 1928.) The strategy of the game.

Selection and Training of the Polo Pony. By Major Grove Cullum. (Scribner, 1934.) "Written by an ex-chief of the Remount Service, this book is the product of years of experience. Illustrated by photographs and charts."—*R. P. T.*

Horses

The Western Pony. Written and illustrated by William R. Leigh. (Huntington, 1933.) A beautiful big horse book with illustrations in color from paintings made by an artist who began painting horses from life when he was 15 years old. "I can't remember the first time I rode a horse," he says, "but it was years before I was able to climb on one." Mr. Leigh was chosen by Carl Akeley to go to Africa to paint the background for the Akeley African Hall of the American Museum of Natural History. He writes in a way boys and men will enjoy of the Navaho pony, the Indian pony, the horse in the Custer fight.

The Horses of the World. By Major-General William Harding Carter. Illustrated from paintings by Edward Herbert Miner. (National Geographic, 1923.) Very fully illustrated in color. Appeals as a picture-book to all ages. Outstanding as to care in the preparation of text and the reproduction of paintings.

Sketches in Stable and Kennel. By Lionel Edwards. (Scribner, 1933.) Pencil sketches and reproductions in color of paintings with notes and commentaries by a modern artist in the English hunting field. His subjects in this volume are for the most part resting at home.

The Art of Riding. By Lieut.-Col. M. F. McTaggart. (Scribner, 1931.) "A textbook for beginners and others. Part I contains a clear exposition of the 'forward seat' in jumping. Part II covers care and training, ailments, stabling, etc. Finely illustrated."—*R. P. T.*

"Saddle Up." Written and illustrated by Captain F. C. Hitchcock. (Scribner, 1934.) Correct methods of choosing, riding, and taking care of a horse are clearly described and made effective by more than 100 descriptive diagrams. An up-to-date book boys and men will find thoroughly alive.

Riding. By Lady Hunloke and Cecil Aldin. Illustrated. (Coward-McCann, 1931.) "A particularly fine book for the child just learning to ride.

Description and definition of tack, parts of horse and elementary riding principles."—*R. P. T.*

School for Riding. By Sergei Kournakoff. (Hale, 1938.) A primer of modern horsemanship. Illustrated with many line drawings and action photographs. For boys and their "riding fathers."

The Young Rider. By Golden Gorse. 3d edition. Revised and enlarged. (Scribner, 1935.) An excellent first book for children who are learning to ride. Very practical directions on the care of ponies written from the standpoint of a man who is working with children.

Horsemanship for Boys and Girls. By Lt.-Col. M. F. McTaggart. (Scribner, 1935.) Written in a delightful vein. Covers all the elements of good horsemanship, for children especially.

Horseback Riding Made Easy. By Baretto de Souza. Line drawings by Jean Sage. (Dutton, 1935.) "An ideal book for the beginner—covers equipment, leg and rein technique, canter, backing, posting, etc."—*R. P. T.*



Will James
III-26

Smoky wondered what a rope was doing up there. A drawing by Will James for his book, 'Smoky, the Cow Horse' (Scribner), a Newbery Medal winner.

Dogs

An Artist's Models. By Cecil Aldin. (Scribner, 1930.) A collection of delightful stories of the artist's own dogs, who have served as his models, with illustrations in which the dogs appear in characteristic poses.

The American Kennel Club Blue Book of Dogs. (Garden City, 1938.) Identifies clearly 92 breeds. The first and only book of its kind.

Just Dogs. Sketches in pen and pencil by K. F. Barker. (Scribner, 1931.) "Here is one of the most delightful dog books yet published. He sketches dogs from the Scotty to the Cocker with text material accompanying his drawings. They are all done in characteristic attitudes."—*R. P. T.*

The Book of Dogs. By Louis Agassiz Fuertes and others. Illustrated with 73 natural color portraits from original paintings by Fuertes. (National Geographic, 1919.) A book with picture-book value for young children and full of information for older ones.

The Cocker Spaniel. By Ella B. Moffit. (Judd, 1935.) "Complete information on history, development, characteristics, standards for Field and Bench. Practical advice on raising, training, and handling."—*R. P. T.*

Tail Waggers. By A. Croxton Smith. (Scribner, 1931.) Contains 150 illustrations. The points of 48 breeds of dogs are described with attention to their welfare.

Our Dogs. By C. E. Harbison. New and revised edition. (Judd, 1935.) "An outstanding book on practical dog keeping for the novice, with many suggestions for the expert as well."—*R. P. T.*

Dr. Little's Dog Book. By George Watson Little. New and revised. (McBride, 1934.) "A book on general dog care with a wealth of veterinary information."—*R. P. T.*

Training the Dog. By Will Judy. (Judy, 1932.) "A complete instruction manual for breeds, especially house pets."—*R. P. T.*

How to Train Dogs. By Henry R. East. (Pitman, 1934.) "A sensible book giving clear directions for teaching a dog mannerly habits and obedience together with 65 lessons on teaching dogs tricks."—*R. P. T.*

Modern Dogs, Their Standards, Care, Feeding, Breeding, Training, and Treatment. By Dr. William A. Bruette. (Grosset, 1934.)

The Complete Dog Book. (Halcyon House, 1938.) Official publication of the American Kennel Club.

Cats

Five Cats from Siam. Text by May Lamberton Becker. Photographs by Thurman Rotan. (McBride, 1935.) Very unusual lifelike photographs of two Royal Siamese cats and their three kittens. The text reveals an intimate knowledge of the daily life of a Siamese cat family.

Cats for Pleasure and Profit. By Frances Simpson. (Pitman, 1924.) Contains much valuable material on the raising and care of the more delicate breeds of cats.

Your Cat, Its Care and Treatment. By A. de Barry-Saunders. (McKay, 1928.) Discusses the raising and care of all kinds of cats.

Sam; Edward Quigley's photographs. Text by John Crawford. (Stackpole, 1937.) Full-page photographs admirably reproduced. A book of special interest to amateur photographers as well as cat lovers.

Cats. By Eleanor Booth Simmons. (Whittlesey House, 1935.) Care and training, habits and history. The author writes on cats and their care for the *New York Sun*.

Pets

All About Pets. By Margery Williams Bianco. Illustrated from photographs with decorations by Grace Gilkison. (Macmillan, 1929.) A readable and reliable little book about the care of rabbits, mice, guinea pigs, birds, turtles, etc. For children under ten years old.

The Pet Book. By Anna Botsford Comstock. Illustrated. (Comstock Publishing Co., 1930.) All kinds of pets are included in this book, first published in 1914. The photographic

illustrations are old-fashioned but the relation between pets and children is clearly shown and the directions for the treatment of animals are based on many years of experience and observation in this field.

Pets and How to Care for Them. By Lee S. Crandall. With illustrations from life. (New York Zoological Park, 1924.) Valuable for its reliable information on housing, feeding, and breeding many kinds of birds, fishes, and mammals.

Fishes

Fishes, Their Journeys, and Migrations. By Louis Roulé. Introduction by William Beebe. (Norton, 1932.) An unusual book which presents one of the most interesting phases of fish life.

Field Book of the Shore Fishes of Bermuda. By William Beebe and John Tee Van. (Putnam, 1933.) Published under the auspices of the New York Zoological Society, this clearly printed small book answers the question, What fish is that? The color plates, photographs, and drawings are excellent.

Young Folks' Book of Fishes. By Ida Mellen. (Dodd, 1927.) "A fish may grow pale from fear or rigid with excitement, it will express disappointment and dejection by its attitude and the poise of its fins." A complete and satisfactory book on fishes by Miss Mellen of the New York Aquarium. Well illustrated and indexed."—*Toronto Public Library.*

Fingerfins. By Wilfred S. Bronson. (Macmillan, 1930.) "Fingerfins could not shut his eyes to sleep at night. He had no eyelids. So he had to watch the noc-ti-lu-cas all night long. . . . At night, the noctilucas seemed to have lights inside them. So he saw them plainly all night long, like millions of tiny electric light bulbs. Once in a while he would yawn quickly and swallow a few dozen."

Fishes and Sea Animals. By Eric Fitch Daglish. (Morrow, 1929.) Text and drawings by an English naturalist.

The Life Story of the Fish. By Brian Curtis. (Appleton, 1938.) A readable and scientifically accurate book about the habits and home life of many species of fish.

Tropical Fishes for a Private Aquarium. By C. W. Coates. (Liveright, 1933.) The author of this book is the Keeper of Tropical Fish, New York Aquarium. He gives expert information in non-technical language for the amateur collector and breeder. Illustrated from photographs.

Goldfish Varieties and Tropical Aquarium Fishes. By William Thornton Innes. 15th edition. (Innes, 1932.) A guide to aquaria and related subjects. Very fully illustrated in black and white and color. Questions from readers have been carefully considered in the frequent revisions of this book.

Tropical Fish and Their Care. By Norbert Lederer. (Knopf, 1934.) A book for beginners as well as advanced aquarists. The directions are very clear and the book contains an excellent bibliography. It represents an ardent hobby on the part of a physician.

Fishes and Their Ways of Life. By Louis Roulé. Translated from the French by Conrad Elphinstone. (Norton, 1935.) Describes different ways of swimming and tells what fishes see. Contains chapters on Electric Fish, the Trigger Fish, the Sun-Perch and the Catfish, the Carp and the Stickleback, etc. The author is a well-known authority at the National Museum of Natural History in Paris.

The Seashore

Along the Shore. By Eva L. Butler. (Day, 1930.) A pocket guide by a keen observer. It tells just the things one wants to know.

The Burgess Sea Shore Book. By Thornton Burgess. (Little, 1929.) The most complete book of seashore life for young children. The color plates are admirable and there is an appendix for the identification of specimens which is useful at any age.

Children of the Tide. By D. M. Henderson. (Appleton, 1926.) A book of beach and ocean wonders for children who like science in story form. Illustrated.

Sea-Beach at Ebb Tide. By Mrs. A. F. Arnold. (Century, 1903.) "A manual for the identification of animal and plant life."

The Shell Book. By Julia E. Rogers. Illustrated in color and in black and white by A. R. Dugmore. (Doubleday, 1914-1934.) A complete and satisfactory book on shells, native and foreign, containing a chapter on aquariums and snaileries.

West Coast Shells. By Josiah Keefe. (Stanford Univ. Press, 1935.) A description in familiar terms of the principal marine, fresh-water, and land mollusks of the United States, British Columbia, and Alaska, found west of the Sierras.

Holiday Shore. By Edith M. Patch and Carroll Fenton. (Macmillan, 1935.) The excellent drawings for a book which describes both Atlantic and Pacific shores were made by Mr. Fenton. For the younger children.

Dwellers of the Sea and Shore. By William Crowder. (Macmillan, 1934.) A reissue of a well-known guide to the life of the sea and the shore, illustrated with drawings and photographs by the author.

Birds

Bird Portraits in Color. Text by Thomas S. Roberts. Illustrated with 92 color plates. (University of Minnesota Press, 1934.) The color plates for this very beautiful new book are from paintings by Allan Brooks, George Sutton, Walter Alois Weber, Francis Lee Jaques, Walter J. Breckinridge. Dr. Roberts, director of the Museum of Natural History, has contributed a brief description of each bird giving size and distinguishing marks, its range, most interesting habits, the type and location of its nest, color of eggs, etc. The book thus becomes an authentic guide for boys and girls of any age as well as a delightful gift book for anyone interested in birds.

A Field Guide to Birds. By Roger T. Peterson. (Houghton, 1934.) A new and interesting way of looking at birds by the presentation of their color values as they appear in flight.

Traveling with the Birds. By Rudyerd Boulton. Illustrated by Walter Alois Weber. (Donohue, 1933.) Bird migration is given a large-size picture-book setting in this new book by the assistant curator of birds at the Field Museum. Illustrated by an artist widely known for his paintings of birds.

Bird Guide: Land Birds East of the Rockies. By C. A. Reed. (Doubleday, 1926.) Pocket-sized book with colored illustrations, brief description of habits, songs, nests, range, etc. Identification key by conspicuous markings.

Bird Guide: Water Birds, Game Birds, and Birds of Prey. By C. A. Reed. (Doubleday, 1926.) Similar to book on land birds.

American Bird Biographies. By A. A. Allen. (Comstock, 1935.) Good reading and fine pictures in color and in black and white by Allan Brooks.

Field Book of Wild Birds and Their Music. By Ferdinand Schuyler Mathews. (Putnam, 1904.)

Handbook of Birds of Eastern North America. By F. M. Chapman. (Appleton, 1934.) An exhaustive manual of the 500 species, free from technicalities, convenient to use, and full of original information. "A description of each species is followed by geographic range, time of presence at different places, and eggs, and a brief account of habits."

Field Book of Birds of Southwestern United States. By L. E. Wyman and Elizabeth Burnell. (Houghton, 1925.)

Familiar Birds of the Pacific Southwest. By Florence V. V. Dickey. (Stanford Univ. Press, 1935.)

Birds of the Ocean, a Handbook for Voyagers. By W. B. Alexander. (Putnam, 1923.) Notes on habits, foods, and migration of sea birds.

Reptiles

Animals in the Sun. By W. W. Robinson. Drawings by Irene B. Robinson. (Harper, 1934.) A fascinating new illustrated book about crocodiles, lizards, turtles, and snakes, by the author of 'Beasts of the Tar Pit'. William

Beebe, in a short introduction, says it is a truthful and a readable book about reptiles.

The Reptile Book. By Raymond L. Ditmars. Illustrated in color and in black and white. (Doubleday, 1933.) The most satisfactory book about the turtles, crocodiles, lizards, and snakes of the United States and northern Mexico.

Snakes of the World. By Raymond L. Ditmars. With illustrations from life. (Macmillan, 1934.) A book largely based on questions about snakes. With the remarkable photographs are authentic and interesting descriptive notes.

The Book of Living Reptiles. By Raymond L. Ditmars. Illustrated in color by Helene Carter. (Lippincott, 1936.) Pictorial maps show just where the world's reptiles are found. Clear descriptive text.

Snakes Alive, and How They Live. By Clifford H. Pope. Illustrated with photographs. (Viking, 1937.) Contains an illustrated key for the identification of the snakes of the United States. A fascinating book in which a boyhood hobby becomes a man's profession.

Geology

The Earth and Its Rhythms. By Charles Schuchert and Clara M. Levene. Illustrated. (Appleton-Century, 1927.) An uncommonly interesting and accurate book produced, the authors state, "by the process of filtering a great mass of geological detail through a non-scientific mind."

Fossils. By Richard Swann Lull. Illustrated. (University Society, 1931.) "What they tell us of plants and animals of the past." The Director of Peabody Museum of Yale University gives a remarkably clear presentation for the reader without technical background.

The Earth, Our Ever-Changing Planet. By Chester A. Reeds. Illustrated. (University Society, 1931.) Contains chapters on Historical Resumé of Geology, the Lithosphere, Earthquakes, Volcanoes, etc. The author is Curator of Geology at the American Museum of Natural History.

The World of Fossils. By Carroll Lane Fenton. (Appleton-Century, 1933.) The author's drawings are a valuable feature of this readable book.

The Romance of Geology. By Enos A. Mills. (Doubleday, 1926.) "Being adventures with glaciers, rivers and wind, fossil hunting, trailing ancient seashores and following mirages of the desert."

The Field Book of Common Rocks and Minerals. By Frederic B. Loomis. (Putnam, 1923.) Contains colored plates and many illustrations from photographs taken by the author to aid in identification.

Butterflies and Bugs

The Butterfly Book. By W. J. Holland. (Doubleday, 1931.) A popular guide to the butterflies of North America, first published in 1907. Full-page color plates. 'The Moth Book' by the same author has also been reissued.

The Butterfly Guide. By W. J. Holland. (Doubleday, 1927.) A pocket manual for the ready identification of the common species found in the U. S. and Canada.

Field Book of Insects. By Frank E. Lutz, Ph.D. (Putnam, 1918.) This is not intended for children but it is nevertheless a valuable handbook for amateur entomologists, young and old. Comprehensive in scope, it has detailed descriptive notes and is fully illustrated.

Fabre's Book of Insects. Retold from Alexander Teixeira de Mattos' translation of Fabre's 'Souvenirs Entomologiques' by Mrs. Rodolph Stawell. Illustrated by E. J. Detmold. (Dodd, 1927.) The beautiful color plates for this book and for 'Insect Adventures', which is also retold from 'Souvenirs Entomologiques', give it a unique place.

Insect Ways. By Clarence M. Weed. (Appleton, 1930.) A series of stories concerning the more important phases of the lives of insects of North America. Illustrated with photographs from life.

American Boys' Book of Bugs, Butterflies and Beetles. By Dan Beard. (Lippincott, 1915.) An interesting and useful book for the collector. Many drawings of insects in various stages of development help to identify the species.

Wild Flowers, Ferns, and Trees

Wild Flowers. By Homer D. House. (Macmillan, 1934.) Contains 364 full-color illustrations with descriptive text of wild flowers which bloom from Texas to Ontario, California to Maine, Puget Sound to Florida. The originals of these beautiful illustrations are in the State Museum, Albany, N. Y. Contains also many line drawings of the anatomy of flowers, leaves, fruit, and stem.

How to Know the Wild Flowers. By Frances Theodora Parsons. Illustrated by Marion Satterlei and Elsie Louise Shaw. New edition with colored plates. (Scribner, 1933.) This book first published in 1893 is the most satisfactory one for identifying wild flowers. Theodore Roosevelt said, "I am delighted with it." The writer has the gift of communicating her own love of the subject as well as accurate information.

Field Book of Western Wild Flowers. By Margaret Armstrong in collaboration with J. J. Thornber. Plates in color, black and white. (Putnam, 1915.) The common wild flowers growing west of the Rocky Mountains are pictured and described.

Flowers of Coast and Sierra. By E. G. Clements. (Wilson, 1928.) Popular account of most common flowers of the Pacific coast from Southern California to Washington.

Cactus. By A. J. van Laren. Translated from the Dutch by E. J. Labarre. Arranged and edited by Scott E. Haselton. Illustrated by C. Rol, J. Voerman, Jr., and H. Rol. (Abbey San Encino Press, Los Angeles, 1935.) Tells what cacti are, structure and habit, origin and development of the cactus family; discusses cacti as a hobby, their propagation and culture. 134 water-color drawings, many black and white drawings.

Field Book of American Wild Flowers. By F. Schuyler Mathews. Colored plates and illustrations in pen and ink. (Putnam. Rev. ed., 1927.) Classified by month with clear descriptions of the characters and habits of flowers, and references to insects which help fertilize them. A standard work with good illustrations.

How to Know the Ferns. By Frances Theodora Parsons. Illustrated. (Scribner.) The opening chapter of this reliable and readable guide book, first published in 1899, is entitled "Ferns as a Hobby."

Field Book of American Trees and Shrubs. By F. Schuyler Mathews. (Putnam, 1915.) Standard, easy-to-read guide to trees, with descriptions and maps showing their general distribution.

Familiar Trees and Their Leaves. By F. Schuyler Mathews. (Appleton, 1911.) Uses leaves as guides to trees.

Trees of California. By W. D. Jepson. (Sather Gate Book Shop, Berkeley, Calif., 1923.) "The best book for California in our collection."—*Los Angeles Public Library*.

Boys' Book of Forest Rangers. By Irving Crump. (Dodd, 1924.) The thrills and the importance of a forest ranger's training and duties are reflected in the articles and stories which compose this book.

Gardens

Beginning to Garden. By Helen Page Wodell. Illustrated. (Macmillan, 1928.) A book that makes a garden seem delightful and attainable to children. Contains valuable directions for those who are interested in exhibiting flowers and vegetables.

The Gardener's First Year. By Alfred Bates. (Longmans, 1936.) A book for older boys and girls in which a well-known gardener answers many questions. Contains a bibliography, botanical information, and seed planting tables.

Rock Garden Primer. By Archie Thornton. Illustrated. (Dodd, 1931.) An American rock garden book. Much space is given to choice of site, rocks, drainage, bulbs, etc. The plant placing diagrams and color plates are excellent.

Adventures in Dish Gardening. Written and illustrated by Patten Beard. (Dodd, 1930.) A book of little indoor gardens, with simple directions on construction and material. Pictures and descriptions of numerous gardens with a list of suggested subjects.

Gardens in Glass. By Mildred Norton Andrews. Illustrated. (Dodd, 1934.) Practical guide telling how to plan and maintain terrariums for mosses, ferns, flowering and evergreen plants. May include an entire landscape in miniature.

Garden Guide, The Amateur Gardener's Handbook. Edited by A. T. De La Mare, 6th edition. Rewritten and greatly enlarged. (Dodd, 1934.) A comprehensive and reliable book dealing with the flowers, fruits, vegetables, the bees, birds, and fish of the Northern and Middle States, and California.

Arrangement of Flowers. By Mrs. Waller R. Hine. (Scribner, 1933.) Deals with three schools of flower arrangement, also discusses table decorations and flower containers. Fine uncolored illustrations.

Birds of the Wild. How to Make Your Home Their Home. By Frank C. Pellett. Illustrated with photographs. (Dodd, 1928.) A suggestive little book on ways of attracting birds to the garden.

Green Grows the Garden. By Margery Bianco. Illustrations by Grace Paul. (Macmillan, 1936.) A readable book for the boy or girl who knows something about gardens. Chapters on the vegetable patch, the herb garden, the rock garden, and house plants.

Mexican Plants for American Gardens. By Cecile Hulse Matschat. Illustrated. (Houghton, 1935.) Early gardens, both Spanish and Aztec. Describes Mexican flowers and plants which are suited to another climate; a pioneer book.

Astronomy

Astronomy from a Dipper. By Eliot C. Clarke. (Houghton, 1909.) The simplest and clearest of books on astronomy. Charts supplied by the author make it easy to find the position of the other constellations from "The Dipper."

Men, Mirrors, and Stars. By G. Edward Pendray. (Funk, 1935.) The story of the telescope as here told will be of special interest to telescope-making clubs.

Introducing the Constellations. By Robert H. Baker. (Viking, 1937.) A companion volume to 'When the Stars Come Out,' in which the whole pageant of the skies is presented with similar pictorial features.

A Beginner's Star Book. By Kelvin McKready. Revised edition. (Putnam, 1923.) An easy guide to the stars and to the astronomical uses of the opera glass, the field glass, and the telescope. Charts of the moon and star maps are given.

The Stars for Sam. By William Maxwell Reed. Edited by Charles E. St. John. Decorations by Karl Moseley. (Harcourt, 1931.) An astronomy which rests on new conceptions of time, space, and matter treated with clarity and imagination. Contains a chapter on Einstein. For boys and girls of junior high school age.

When the Stars Come Out. By Robert Baker. Illustrated with photographs, maps, and charts. Decorations by Boris Artzybasheff. (Viking, 1934.) The arresting character of its pictorial features and the recent developments covered give this book a special claim in rousing genuine interest in astronomy among older girls and boys. Includes a description of the Adler Planetarium.

Chemistry

Book of Experiments for Junior Chemists. (Winn, 1931.) Boys like this book of experiments very much.

Boy Chemist. By A. Frederick Collins. (Lothrop, 1924.) A book of experiments. By making the experiments as they are presented in this book one may gain a working knowledge of chemistry.

Beginnings of Chemistry. By Harriett Beale. (Coward, 1929.) A clear presentation of the early history of chemistry with technical terms simply explained.

The Boys' Own Book of Science. By Floyd L. Darrow. (Macmillan, 1931.) Practical guide for boys who wish to experiment at home. Experiments in chemistry and physics, illustrated with diagrams and photographs.

Practical Everyday Chemistry. By Harry Bennett. (Chemical Publishing Co. of New York, 1934.) How to make

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what you use; practical modern working formulae for making hundreds of products; no theory.

Modern Chemistry. By Frederick Prescott. Illustrated. (Sampson, London, 1932.) The romance of modern chemical discoveries interestingly presented. Contains chapters on The Scope and Development of Chemistry, The Atoms and Beyond, The Story of Radium, Explosives, Color Chemistry.

Inside the Atom. By John Langdon-Davies. (Harper, 1933.) A very readable introduction to chemistry and physics by a writer who sees science as the great field of adventure.

Physics

Romping Through Physics. By Otto Willi Gail. Illustrated by Hermann Blank. (Knopf, 1934.) The most obvious facts in physics treated in an entirely logical sequence. A first book. The clever drawings in color are based on things every child should know.

Physics of Today. By J. A. Clark. (Houghton, 1938.) The fundamental laws and principles of physics are clearly set forth. Experiments are illustrated by many diagrams.

Boys' Book of Experiments. By A. Frederick Collins. (Crowell, 1927.) These experiments begin with very simple apparatus and gradually become more difficult. Home-made materials can be used.

New World of Physical Discovery. By Floyd Darrow. (Bobbs, 1930.) A comprehensive, historical discussion of physics in non-technical language.

The Microscope

The Book of the Microscope. By Gerald Beavis. (Lippincott, 1931.) A book of clear directions for the care and use of different types of microscopes. For the beginner.

Seeing the Unseen. By Robert Disraeli. (Day, 1933.) A novel picture-book made by the microscope. The author's photo-micrographs are accompanied by descriptive text on the varied use and care of a microscope.

Experimental Optics. By A. Frederick Collins. Illustrated. (Appleton, 1933.) A series of simple experiments with light. Tells how to make and use a microscope, telescope, spectroscope, polariscope, magic lantern, moving picture camera and projector, etc.

Photography

How to Make Good Pictures. (Eastman Kodak Co., 1935.) An excellent handbook for the amateur photographer. Explains developing and printing.

Photography for Fun. By William M. Strong. (Leisure League, 1934.) An introductory book written in a popular style giving fundamental information without technical detail. Beautifully illustrated from photographs. Definitions of photographic terms and a brief bibliography.

Practical Photography Series. By Frank R. Fraprie. (American Photographic Publishing Co.) Of the twelve booklets in this series, the following are particularly useful: 'Beginners' Troubles', 'The Secret of Exposure', and 'How to Make Enlargements'.

The Photographic Dark Room. By E. J. Wall. (American Photographic Publishing Co., 1933.) Practical instructions for fitting up and using a dark room in the home.

Leica Manual. By W. D. Morgan and H. M. Lester. (Morgan and Lester, 1935.) Though prepared specially for Leica owners, this book is one of the most complete and trustworthy guides for all miniature camera users and for the users of larger instruments as well.

The Fun of Photography. By Mario and Mabel Scacheri. (Harcourt, 1938.) Explains the principles of successful photography with emphasis on the mind behind the lens; 375 half-tone illustrations. Brilliant and instructive.

Cine-photography for Amateurs. By J. H. Reynier. (American Photographic Publishing Co., Boston, 1931.)

Movie Making Made Easy. By William J. Shannon. (Moorfield, Nutley, N. J., 1934.) A handbook for the amateur movie maker who would make the best use of his equipment.

Electricity

The New World of Science. By A. Frederick Collins. (Lippincott, 1934.) A fully illustrated book for every age explaining the outstanding experimental apparatus and machinery exhibited at the Century of Progress: the Stroboscope which makes rapidly moving objects look as if standing still; the electro-mechanical Robot which obeys spoken commands without any connection other than a beam of light; the principle of television, etc.

Book of Electrical Wonders. By Ellison Hawks. (Dial, 1931.) The story of the development of electrical power. The author tells how electric light, the telephone and telegraph, X-rays and television became part of our daily life, and explains how they work.

Experimental Television. By A. Frederick Collins. (Lothrop, 1933.) Describes experiments which demonstrate the principles of television, and which require only simple apparatus.

Harper's Electricity Book for Boys. By Joseph H. Adams. Illustrated. (Harper, 1930.) Clear directions for making everyday electrical appliances with home-made apparatus at small cost. Glossary of electrical terms and phrases.

The Amateur Electrician's Handbook. By A. Frederick Collins. (Crowell, 1924.) A book on general electricity, with simple experiments and full details for constructing apparatus. Contains a chapter on motor-car ignition, lighting, and starting.

Electrical Amusements and Experiments. By Charles R. Gibson. (Seeley Service, London, 1925.) Experiments, illusions, and conjuring tricks easily performed, with directions for making inexpensively the necessary apparatus.

Gasoline Engine Book for Boys. By A. Hyatt Verrill. (Harper, 1930.) The general principles of gasoline engines, with sections on marine, stationary, and automobile motors.

Working with Electricity. By Katherine S. Keelor. Illustrated. (Macmillan, 1929.) A book of lights, bells, magnets, and messages. Children of the Lincoln School of Teachers College, Columbia University, assisted in working out the material presented in this little book.

Television for the Amateur Constructor. By H. J. Barton Chapple. Illustrated. 2d edition. (Pitman, 1934.) Transmission of sight by radio.

Radio

Radio Construction and Repairing, Including the Television Receiver. By James Ambrose Moyer and John F. Wostrel, 4th edition. (Whittlesey House, 1933.) Explains fundamentals and describes receiving sets; how to build, operate and test them and remedy troubles.

How to Build and Operate Short Wave Receivers. Edited by Hugo Gernsback. (Short Wave Craft, 1932.) Pamphlet. Includes: Receivers for Beginners; Short Wave Converters; Superheterodynes; Super-Regenerators; Television.

Radio-Up-to-the-Minute. By Arthur R. Nilson. (Clode, 1929.) Complete theoretical and practical explanation of radio in non-technical language.

Radio. By John Langdon-Davies. (Dodd, 1935.) The story of the capture and use of radio waves. Young people will enjoy the simple and graphic style.

The Radio Amateur's Handbook. (American Radio Relay League.) Revised annually. Contains elementary data but gives the latest developments, including television and short-wave transmission and reception.

Fundamentals of Radio. By F. E. Terman and F. W. MacDonald. (McGraw, 1938.) For those who already have a working knowledge of electricity.

Magic

Magic in the Making. By John Mulholland and Milton M. Smith. Illustrated. (Scribner, 1925.) The simplest book on magic, illustrated with diagrams and drawings which are clear and workable.

200 Tricks You Can Do. By Howard Thurston. (Sully, 1932.) This book and a second volume, '200 More Tricks You Can Do', are reliable sources.

Modern Magic, a Practical Treatise on the Art of Conjuring. By Professor Hoffman. Illustrations. (McKay, 1933.) First published in England in 1878, this old and authentic book is a veritable gold mine for the boy who is genuinely interested in magic.

How's Tricks? By G. L. Kaufman. (Stokes, 1938.) A small book of tricks and stunts requiring very few properties and no special skill to perform. Illustrated with drawings by the author.

Quicker Than the Eye, the Magic and Magicians of the World. By John Mulholland. Illustrated by Cyrus Leroy Baldridge. (Bobbs, 1932.) A readable book about magicians of the past and present. Includes a chapter on the author's own experiences as a magician at home and abroad.

John Mulholland's Story of Magic. By John Mulholland. (Loring and Mussey, 1935.) Early magic shows and the development and progress of magic to the feats of magicians of the present day are clearly described and fully illustrated with reproductions from old prints and photographs.

Camping

Camping and Woodcraft. By Horace Kephart. (Macmillan, 1937.) "The most comprehensive book on living in the open ever published."—R. P. T.

Shelters, Shacks, and Shanties. By D. C. Beard. (Scribner, 1929.) Gives directions for making all sorts of camps from the simplest shelter to a complex log cabin. Many drawings by the author.

Book of Woodcraft and Indian Lore. By Ernest Thompson Seton. (Doubleday, 1912.) Scouting, camping, forestry, wildwood remedies, natural history, customs and ceremonials of the Indians. Includes some Indian stories and legends.

Camping and Scouting Lore. By Atwood Townsend. (Harper, 1930.) Hiking, woodcraft, camping, nature study, first aid, etc., for the beginner.

Camp Craft. By Warren Miller. (Scribner, 1922.) A practical guide to camping with emphasis on home-made equipment. Gives specific directions on tents, beds, kits, fires, accessories, etc.

The Canoe. By Robert E. Pinkerton. (Macmillan, 1932.) Its selection, care, and use.

The Elements of Canoeing. By Albert Van Sichen Pulling. (Prakken, Ann Arbor, 1933.) "A textbook on canoeing for the expert as well as the beginner. Safety, strokes, equipment, care, war canoeing, canoe sailing, racing, cruising, portaging, etc."—R. P. T.

Packing and Portaging. By Dillon Wallace. (Macmillan, 1932.) A handbook for all who take the trail for sport, recrea-

tion, health, or necessity. Describes proper outfits for various means of travel and tells how to pack and transport them.

Jack-Knife Cookery. By James A. Wilder. (Dutton, 1929.) "A cook book for life in the open which tells how any hiker or camper with a jack-knife may prepare a square meal."

Camp Cooking. By Horace Kephart. (Macmillan, 1910.)

First Aid for Boys. By Dr. Norman B. Cole and Clayton H. Ernst. (Appleton, 1917.) "Manual for Boy Scouts and others interested in prompt help for the injured and sick."

The Book of Camp-Lore and Woodcraft. By D. C. Beard. (Garden City, 1936.) A standard work, originally published by Lippincott.

Log Camps and Cottages. By Dr. William A. Bruette. (Watt, 1934.) Covers the building and planning of various types of log cabins from small fishing camps to substantial log homes.

Camp Management. By Henry W. Gibson. Illustrated. (H. W. Gibson, Watertown, Mass., 1926.) A useful manual for camp directors.

Cooking

Kitchen Fun. By Louise Price Bell. (Harter, 1932.) Simple recipes with pictorial illustrations in color. Designed for little children learning to cook with inexpensive materials.

Jane-Louise's Cook-Book. By Louise Price Bell. (Coward-McCann, 1934.) A new edition of a hand-lettered and charmingly illustrated cook book for little girls that makes cooking seem like play. Recipes for simple breads, cakes, desserts, and candy.

The National Cook-Book, a Kitchen Americana. By Sheila Hibben.

(Harper, 1932.) A book of recipes contributed by every state in the Union that will give girls in the teens real enthusiasm for the variety and riches of American cooking at its best.

The Boston Cooking School Book. By Fannie M. Farmer. Revised, with illustrations. (Little, 1934.) A widely known standard cook book which gives temperatures and time schedules and takes account of modern refrigeration. 121 menus are included in the latest edition.

The Modern Salad and Dessert Book. By Mabel Claire. (Greenberg, 1933.) Includes illustrated party suggestions of special interest to young people. Based on the use of the modern refrigerator. Attractive format makes it suitable for a gift book.

Candy and Candy Making. By Mary B. Bookmeyer. (Manual Arts Press, 1929.) For the home candy maker. Clear and comprehensive.

It's Fun to Cook. By Lucy M. Maltby. Illustrated by Ruth King. (Winston, 1938.) The first part of the



An old-time Japanese magician "puts in his thumb." Reproduced from an ancient print belonging to John Mulholland, author with Milton M. Smith of "Magic in the Making" (Scribner).

book is a story with recipes interspersed. The second part is made up of recipes. An attractive book well indexed.

Handicrafts

The Complete Knitting Book. By Marjory Tillotson. Edited by Davide C. Minter. (Pitman, 1933.) A most attractive book with easy-to-follow diagrams for knitting every kind of a knitted thing for woman, child, or man. Beauty and originality are given place in the plan. For beginners and experts.

Handicraft for Girls. By Edwin T. Hamilton. (Dodd, Mead, 1932.) A most attractive, well-illustrated book. Contains chapters on hooked rugs, lino-block printing, batik, art metal jewelry, leather craft, and other subjects of interest to older girls. There is also an excellent bibliography.

Modern Needlecraft. Edited by Davide C. Minter. (Scribner, 1932.) A large and effectively illustrated book with color plates, dealing with embroidery, plain and pattern knitting, crochet work, dressmaking, millinery, mending and repairing, rug-making, etc., in up-to-date terms. For older girls and their mothers.

The Art and Craft of Leatherwork. By Cecile Francis-Lewis. (Seeley, London, 1928.) "A detailed and practical guide to the tooling, modeling, carving, and other means of decorating leather, and to the making and covering of articles in that material; with instructions on cleaning, staining, coloring, and gilding, etc."

Batiks, and How to Make Them. By Pieter Mijer. Illustrated. (Dodd, 1925.) Tells how it is done in Java and Holland, describes the process, the materials and the tools, successful dyeing, etc.

Sue Sew and Sew. By Flavia, Delhi, and Asta Gág. (Coward-McCann.) Sue Sew and Sew is a doll and she teaches mothers of dolls just how to make a wardrobe for their dolls. The directions are full, simple, and direct. Better than most of the sewing books for small children.

Popular Crafts for Boys. By Edwin T. Hamilton. (Dodd, 1934.) "Step-by-step instructions with accompanying line sketches have been given for making at least one article of each craft: carpentry, mask-making, lino-block printing, book-binding, leathercraft, pottery craft, tin-can craft, miniature modeling, trick photography, soap sculpture, paper mosaics, plastic wood modeling, art metalcraft, wood carving."

Complete Book of Modern Crafts. By H. A. Reynolds. (Greenberg, 1938.) Mask making, photography, bookbinding, and other crafts are treated in a way to interest adults as well as boys and girls. Effectively illustrated.

Dolls to Make for Fun and Profit. By Edith Flack Ackley. (Stokes, 1938.) A practical guide for making dolls and dolls' clothes.

Knit One, Purl One. By E. L. Shields and H. D. Wemple. (Stokes, 1938.) A knitting and crocheting book for little girls with illustrations showing the correct handling of needles, the making of stitches, and the finished article. The authors are expert teachers of knitting.

Building

American Boy's Handy Book. Written and illustrated by Daniel C. Beard. (Scribner, 1882-1925.) "The first working drawings of a birch bark canoe, tailless kite, and a paper balloon ever printed were published in this book," says the author of the pioneer of all handicraft and building books, in his preface to a new edition. The book has stood the test of more than fifty years.

Home Craftsmanship. By Emanuele Stieri. (Whittlesey House, 1935.) Materials, tools, and methods of work in the home workshop. Contains chapters on different kinds of woods, the use of hand and motor-driven tools, metals, metal working, etc. Illustrated with pen and ink drawings.

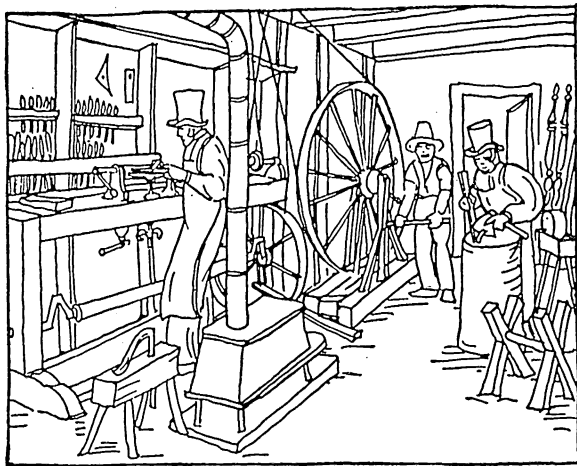
Homemade Games. By Arthur Lawson. With a foreword by Angelo Patri. (Lippincott, 1934.) Instructions for building as well as playing shuffleboard, badminton, tether ball, cocka-maroo, table tennis, and other popular games. The index includes a classification of games and the number of

players required for each game. A suggestive book which will prove helpful to camp leaders as well as to boys.

Outdoor Handicraft for Boys. By A. Neely Hall. (Lippincott, 1938.) A variety of projects which can be made with simple tools—ski board, aquaplane, diving raft, trailers for bicycles, etc.

Your Workshop. By Edna Plimpton. (Macmillan, 1928.) The workshop; tools, wooden toys, boats, puppets, etc., for younger children.

Carpentry and Mechanics for Boys. By A. Neely Hall. (Lothrop, 1918.) "Profusely illustrated with working drawings, diagrams, and halftones, and has a good index. . . . Air-



A Woodworking Shop—early American. A drawing by Thomas Hibben for his 'The Carpenter's Tool Chest' (Lippincott).

craft, seacraft, underseacraft, and garden craft, all developed by the war, are emphasized in this volume."

The Carpenter's Tool Chest. By Thomas Hibben. Illustrated by the author. (Lippincott, 1933.) A well written and delightfully illustrated book designed to give children clear ideas of the development of tools and the work of carpenters down the ages.

The Boy Builder. By Edwin T. Hamilton. (Dodd, Mead, 1933.) Contains full directions for making more than 100 articles out of wood with explanations of each tool and its use. The plans by the author were tested by boys before they were included in the book. Excellent up-to-date diagrams and drawings.

Railroads

Railway Engines of the World. By Brian Reed. (Oxford, 1934.) The principal engines hauling trains on the railways of the world today shown in a series of excellent photographic plates accompanied by informative text. American streamlined trains are represented.

Trains, Tracks, and Travel. By T. W. Van Metre. (Simmons-Boardman, 1936.) A completely satisfying book on railroads and transportation for boys of 10 years' old and older by an authority on the subject.

Trains. By Robert Selph Henry. (Bobbs, 1937.) The story of the development of American railroads and railroad-ing told in a way to interest older boys and their fathers. Numerous photographic illustrations and a historical pictorial map indicating railroad routes inform the text.

The Wonderful Locomotive. By Cornelia Meigs. Illustrated by Berta and Elmer Hader. (Macmillan, 1933.) A railroad story which carries the conviction of reality to younger children. Well written and extremely popular.

Little Blacknose: Story of a Pioneer. By Hildegard Hoyt Swift. Illustrated by Lynd Ward. (Harcourt, 1929.) A true story, delightfully told for younger children in text and pictures, of the DeWitt Clinton Engine, which made history by drawing the first train from Albany to Schenectady and which now stands in the Grand Central Station in New York.

Building a Model Railroad. By Albert Sprague Coolidge. (Macmillan, 1929.) Clear directions for building a miniature railroad. Good illustrations and diagrams.

Automobiles

Wide Road Ahead. By Henry B. Lent. Illustrated by Earle Winslow. (Macmillan, 1934.) The building of an automobile. The first book for children on the assembling of an automobile. Well written and effectively illustrated.

Automobiles from Start to Finish. By Franklin M. Reck. (Crowell, 1935.) Where automobiles come from, what they do, and where they go. Photographs, maps, and diagrams.

Automotive Essentials. By Ray F. Kuns. (Bruce, 1932.) A vivid pictorial presentation of the motor car accompanied by a clear exposition of its various parts and functions. Boys find this a satisfactory book.

Engineering

Bridges. By Henry H. Bormann. (Macmillan, 1934.) The author of this photographic panorama of bridges in the United States has made bridges his hobby. The excellent informative text has been checked from the engineering standpoint for accuracy. It is the selection of types with an eye for the beauty of the environment and the clarity of the presentation of the whole subject which make this an outstanding book.

What Engineers Do: an Outline of Construction. By Walter D. Binger. (Norton, 1928.) The story of what has been accomplished in the fields of civil engineering and construction told by an engineer who knows the men, ideas, and materials he writes about.

The Story of Skyscrapers. By Alfred Morgan. Illustrated with photographs and drawings by the author. (Farrar, 1934.) Clear concise descriptions of each process and material used in the building of the skyscraper. "Putting up the Empire State Building" is the title of one chapter.

The Boys' Book of Remarkable Machinery. By Ellison Hawks. Illustrated. (Dodd, 1928.) Describes and illustrates how steam engines and gasoline engines work, and what machinery on ship board, in the steel forging mill and elsewhere can do.

The American Boys' Engineering Book. By A. Russell Bond. (Lippincott, 1918.) Enables the boy to do his own engineering. Surveying, sounding, navigation, roads, wharves, bridges, etc., are described with clear building directions.

How the Derrick Works. Pictures and text by Wilfred Jones. (Macmillan, 1930.) Distinguished drawings with text which is interesting for older boys as well as younger children.

What Makes the Wheels Go 'Round. By George E. Bock. (Macmillan, 1931.) An arresting book for boys containing a graphic representation in color of the Archimedes screw.

Big Fellow: the Story of a Road-Making Shovel. By Dorothy Walter Baruch. With illustrations by Jay Van Everen. (Harper, 1929.) The drawings for this realistic book for young children are admirable.

A Steam Shovel for Me! By Vera Edelstat. Illustrated by Romano. (Stokes, 1933.) Realism presented with imagi-

nation and human interest in a series of drawings which interpret a text of uncommon clarity.

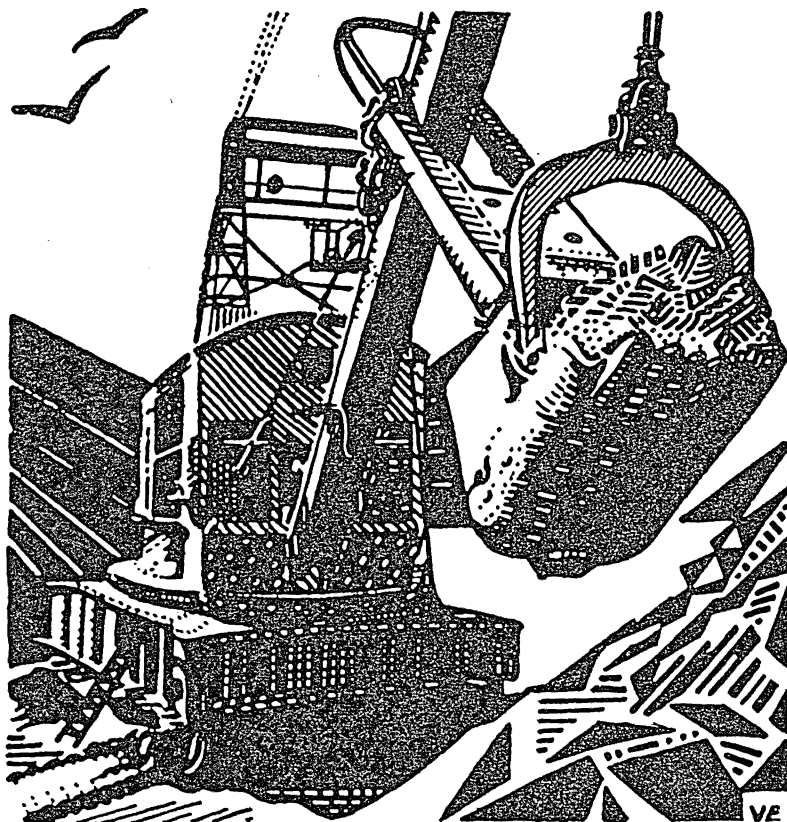
Drawing and Modeling

Line and Form. By Walter Crane. (Macmillan, 1900.) Invaluable both for text and drawing by a master of draftsmanship. Illustrated with his own designs.

Composition. By Arthur Wesley Dow. 15th edition revised and enlarged with new illustrations and color plates. (Doubleday, 1925.) A book for girls and boys who have a genuine interest in art, by a pioneer teacher who maintained that art should be approached through composition rather than imitative drawing.

Freehand Drawing Self-Taught. By Arthur L. Guptill. (Harper, 1933.) Part I contains chapters on object drawing, pencil drawing, pen and ink, etc., fully illustrated by the author who is a well-known art instructor. Part II consists of a portfolio of sketches by many artists, showing a wide variety of subjects, media, and techniques. Upon each one the author comments briefly. A valuable book.

Drawing for Children and Others. By Vernon Blake. (Oxford, 1927.) "Drawing is a beautiful and intensely inter-



Red Rock trembled when the shovel's iron teeth sank in. A drawing by Jay Van Everen for Dorothy Walter Baruch's 'Big Fellow: the Story of a Road-Making Shovel' (Harper).

esting thing and so is the learning of it. . . . It is nothing else than knowing how to see the beauties of construction and of effect in the natural universe, in a word learning to draw is learning to see."

Drawing for Beginners. By Dorothy Furniss. (Bridgman, 1928.) "A practical, simply-written book which children may read for themselves. One chapter is devoted to 'Color and how to find it'. Fully illustrated with drawings by the author."

Making Water Colors Behave. Illustrated. By Eliot

O'Hara. (Putnam, 1932.) A book written primarily for beginners in water color. Contains a partial bibliography of useful books for the water colorist.

Important People. By J. H. Dowd. (Scribner, 1930.) Living children on the seashore, at play, or at the zoo caught in pencil sketches of unusual quality.

A Method for Creative Design. By Adolfo Best-Maugard. (Knopf, 1926.) Nature motifs used as a basis for teaching decoration and design. A fascinating book for anyone.

Animal Drawing in Outline. By E. G. Lutz. (Dodd, Mead, 1931.) A practical and very popular book for children who want to make pictures.

How to Draw Cartoons. By Clare Briggs. (Harper, 1926.) This is a pictorial biography of the late Clare Briggs, cartoonist, as well as a book on the subject. The examples given represent a cross-section of American life of the period.

A Manual on Caricature and Cartoon Drawing. By L. A. Doust. (Warne, 1932.)

Modeling and Sculpture. By F. J. Glass. (Scribner, 1929.) A practical treatise for students, with a brief history of the art.

The Art of Pottery. By Irma M. Gall and Vivian M. Van Etta. (Bruce, 1930.) For the inexperienced worker.

Playing with Clay. By Ida W. Wheeler. (Macmillan, 1927.) An attractive and suggestive little book on clay modeling for younger children.

Alphabets Old and New. By Lewis F. Day. (Scribner, 1920.) Containing over one hundred and fifty complete alphabets, thirty series of numerals, and numerous facsimiles of ancient dates, etc. for the use of craftsmen, with an introductory essay on "Art in the Alphabet." A most satisfactory book.

Lettering. By Thomas Wood Stevens. (Prang, 1916.) A book which presents good standards in drawing of letters with brief introductions.

Pattern Design. By Lewis F. Day. 2d edition revised and enlarged by Amor Fenn. (Scribner, 1933.) A book for students, treating in a practical way of the anatomy, planning, and evolution of repeated ornament.

The Human Figure. By John H. Vanderpoel. (Inland Printer, 1915.) An excellent book which makes the study of drawing of the human form very clear. The author is instructor and lecturer at The Art Institute of Chicago.

Painting as a Hobby. By S. D. Thach. (Harper, 1937.) A primer for the amateur. An excellent bibliography serves as a guide to further study.

African Shadows. By Ugo Mochi. (Ballou, 1933.) The silhouettes of animals in this book are accompanied by interesting text about the animals and an explanation of how silhouettes are made. (Sheets with printed directions for cutting are included.)

Music

Music on the Air. By Hazel Gertrude Kinsella. (Viking, 1934.) "There is no single statement made, topic suggested, or piece of music discussed in Music on the Air—from the oldest folk-tune to the latest opera—which is not the result of a question asked by some music lover or radio listener."

The Way Man Learned Music. By Robert W. Claiborne. (Claiborne, 1927.) A book in which the child learns the development, use, and examples of the best music for the drum, pipes of Pan, and the marimba.

First Steps in Playing and Composing. By Satis Coleman. (Day, 1926.) A very practical book which can be used easily with youngest children.

Alice in Orchestra. By Ernest La Prade. (Doubleday, 1925.) A novel way of presenting the modern symphony orchestra. The author was a member of the orchestra which first gave symphony concerts for young people.

Making an Orchestra. By Dorothy Berliner Commins. (Macmillan, 1931.) Descriptions of all the instruments by families: the strings, the wood winds, the brass winds, the percussion instruments. Also a chart, with cut-outs, to set up a small orchestra on paper.

The Drum Book. By Satis N. Coleman. (Day, 1931.)

The story of the drum and its development. The plates make it fascinating to children.

How Music Grew from Prehistoric Times to the Present Day. By Marian Bauer and Ethel Peyser. (Putnam, 1925.) A readable and reliable book illustrated with well-chosen reproductions of famous paintings of musical subjects.

Fun with Flutes. By David Dushkin. Book design and illustrations by Alfred D. Sterges. (University of Chicago Press, 1934.) Tells in a very clear, delightful way how to make and play a flute. Contains a number of selections of music arranged for the flute. An original book with excellent working drawings.

Song Books

The Baby's Opera. By Walter Crane. (Warne.) Old rhymes with music by the earliest masters.

Old Nursery Songs of Long Ago. By Alfred Moffat. Illustrated by H. Willebeek Le Mair. (McKay, 1911.) Traditional English rhymes set to music. The melodies are as familiar to children as the words.

Lilburliero. By Lady Bell. Illustrated by Pauline Trevelyan. (Oxford, 1933.) Traditional English and two French tunes with new accompaniments which follow carefully the style of the original compositions.

Vieilles Chansons pour les Petits Enfants. Illustrated by M. Boutet de Monvel. Plon-Nourrit. (Brentano.) Every French child knows and sings the old songs, some of which go back to the 13th century. Boutet de Monvel gave them a pictorial interpretation which delights both children and grown people. He also illustrated 'Chansons de France.'

Chantons un peu. By Ruth Muzzy Conniston. (Doubleday, 1933.) A collection of French songs with games, dances, and costumes arranged to assist in learning the French language.

The Sing Song Picture Book. By Heribert and Johannes Grüger. English words by Betty Gram-Swing. (Lippincott, 1931.) "Flowers, birds, angels, stars, horses, clocks, ships, etc., become musical notes to represent the line of a musical melody. Each musical section has its special color and this, too, is used at each repetition of a musical theme."—*Introd.* This book and a second volume are also available in the original German. (Westermann.)

Sang und Klang fürs Kinderherz. By Engelbert Humperdinck. 2 vols. (Neufeld, 1924.) Humperdinck has chosen for this collection not only folk-songs but songs by Mozart, Mendelssohn, Brahms, and others, which derive from folk melodies. The text is in German. The illustrations in color are interpretative to a child.

Canilene Popolari dei Bimbi d'Italia. By Elizabetta Oddone. Disegni di Marco Montedoro. Istituto Italiano d'Arti grafiche. (Westermann, 1920.) Italian folk-songs and dances illustrated in the true spirit by an artist who has done most interesting work in an American theater.

Sing It Yourself. By Dorothy Gordon. (Dutton, 1928.) A collection of folk-songs from "The Young People's Concert Hour" with interesting notes about them.

The Gingerbread Man, and Other Songs of the Children's Story-Book Friends. By Satis N. Coleman. Illustrated by Ruth Hambidge. (Day, 1931.) This song book by the author of 'Creative Music in the Home' is a delightful one for the younger children.

New Songs for New Voices. Edited by Louis Untermeyer and Clara and David Mannes. With drawings by Peggy Bacon. (Harcourt, 1931.) Songs from well-known modern poets which have been expressly set to music by contemporary composers. Families who enjoy singing will find some jolly songs in this big book.

American Songs for Children. Collected by Winthrop B. Palmer. (Macmillan, 1931.) A collection of representative American folk-songs with an unmistakable appeal.

Play Production

Acting: The First Six Lessons. By Richard Boleslavski. (Theatre Arts, 1934.) Dialogues between a would-be actress and a well-known producer in which he stresses the impor-

tance of concentration, memory of emotion, dramatic action, characterization, observation, and rhythm.

How to Produce Amateur Plays. By Barrett H. Clark. (Little, 1930.) Contains lists of plays by country, a bibliography of books on production, costume, scenery, etc., and a chapter on copyright and royalty.

The Book of Play Production. By Milton Smith. Introduction by Brander Matthews. (Appleton, 1926.) Full and practical directions covering all phases of play production. Prepared for use in little theaters, schools, and colleges. Many excellent diagrams.

Practical Stage Directing for Amateurs. By Emerson Taylor. (Dutton, 1916.) A simple, clear and comprehensive handbook for the amateur director and actor.

Costuming a Play. By Elizabeth B. Grimball and Rhea Wells. Designs by Rhea Wells. (Century, 1925.) Clear directions for designing costumes, with particular emphasis on materials and color. Contains also a brief history of costume and excellent plates showing changes in line and silhouette from the early Assyrian to the Civil War period.

The Folk Costume Book. By Frances H. Haire. (Barnes, 1927.) Twenty-two European folk costumes simply described; also, four United States period costumes, the American Indian, the Colonial Period; the Western Frontier Period; 1850-1870. 20 colored plates.

The Art of Make-Up. By Helena Chalmers. (Appleton, 1928.) Clear directions for making up natural and character parts.

Time to Make Up. By Richard B. Whorf. (Baker, 1930.) A practical handbook in the art of grease paint. Illustrated by the author.

Stage Scenery and Lighting. By Samuel Selden and H. D. Sellman. (Crofts, 1934.) A comprehensive and practical handbook by two technical directors—one of the Carolina Playmakers, the other of the University of Iowa Theatre. Contains excellent chapters on scenery design and painting.

Lighting the Stage with Home Made Equipment. By Jack Stuart Knapp. (Baker, 1933.) Clear explanation of lighting, and directions for making equipment for those who have limited funds or who produce seldom.

Lighting the Amateur Stage. By Henning Nelms. With line-out illustrations. (Theatre Arts, 1931.) A practical layout especially designed for amateur groups.

A Log Cabin Theatre. By Frederick H. Koch. Illustrated. (Theatre Arts.) One of a number of interesting booklets prepared by a pioneer in the Little Theatre movement.

Marionettes

Be a Puppet Showman. By Remo Bufano. (Appleton-Century, 1933.) The best book of practical instructions. It includes both hand and string puppets, gives descriptions and diagrams for bodies of cloth, wood, and papier-mâché. It is simply written and is a book the boys and girls themselves will read. Of special interest to boys of twelve years and older.

Marionettes. By Edith Flack Ackley. (Stokes, 1929.) The best single book on cloth marionettes. Contains chap-

ters on making a simple stage, on making cardboard properties and on costuming marionettes as well as on cutting and sewing the bodies. Good patterns are included. Younger children like this book. Children in bed find it usable.

Handbook of Fist Puppets. By Bessie A. Ficklen. (Stokes, 1935.) Compares fist puppets and marionettes; gives history of fist puppets; tells how to make them, dress and act them; suggests types of plays.

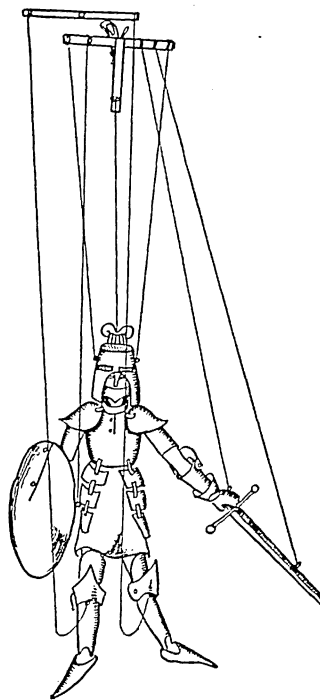
Marionettes, Masks, and Shadows. By Winifred H. Mills and Louise M. Dunn. Illustrated. (Doubleday, 1930.) An excellent all-round book for marionette makers. The authors use their varied experience with groups at the Fairmont Junior High School and the Cleveland Museum of Art. It is one of the few books to include chapters on masks and shadow puppets. It includes also a bibliography of suggestions.

A Book of Marionettes. By Helen Haiman Joseph. Revised. (Viking, 1929.) A readable inclusive history of marionettes from the earliest times. Illustrated with good photographs.

Making Marionettes. By C. E. Rossbach. (Harcourt, 1938.) Older boys and girls and adults will find this book practical and suggestive. Text and illustrations are uncommonly clear in every detail. Three plays are included with effective sketches for their settings.

Animal Marionettes. By Paul McPharlin. (Puppetry Imprints, Birmingham, Mich., 1936.) Clear directions and drawings for the construction of animal marionettes are presented in the only book of its kind.

A Repertory of Marionette Plays. By Paul McPharlin. (Viking Press, 1929.) "This is excellent for showing the scope and complexity of successful marionette plays here and abroad. The photographs are most interesting. Probably few if any marionette groups could ever give such plays but such a book is a great stimulation."



Ready for a duel. The "string control" knight awaits his opponent. Remo Bufano has illustrated his own book, 'Be a Puppet Showman' (Century).

PORTRAIT OF A YOUNG HOBBY-RIDER

... He modeled in clay, he painted in water colors, he composed unrecorded melodies; ... he was an "out-of-door naturalist" and explorer of rivers, caves, and valleys; he was a collector and classifier of stamps, minerals, coins, curiosities from the Holy Land, insects, flowers, birds' eggs; ... he was knocked down by experimenting with the current in a trolley wire, he manufactured gunpowder, and cannon from brass shotgun shells, he molded bullets, he tanned squirrel skins, he attempted to stuff birds, he made maps of pulped butcher's paper; ... he raised pigeons, chickens, rabbits, and snakes; ... he

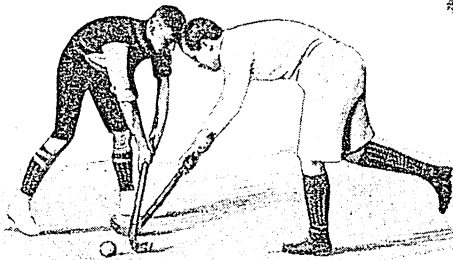
examined openings in the fruit industry, ... and the newspaper business; but most of all his heart was set on gold mining, exploring Indian graves, and swinging a rawhide lariat from a saddle of Spanish leather while spurring a lean broncho after the mavericks, scurrying through the sagebrush of a western mesa.

... He found time and means and energy for all this rich and various life by the time he was thirteen.

—from 'Points of View' by Stuart P. Sherman. (Scribner, 1924)

HOCKEY. Modern hockey is a development from a crude game played very early in Europe. An altar pot in the Copenhagen National Museum, made in the 14th century, shows hockey players; and the ancient Persians and Greeks seem to have had similar games. The name probably comes from the French *hoquet*, meaning a "shepherd's crook," from the shape of the stick used. It has been called "hurley" in Ireland, "shinty" in Scotland, and "bandy" in Wales.

In field hockey the players hit a white leather-covered ball of cork and twine, about 9 inches around, with a hooked stick, in an effort to drive it through the opponent's goal. The regulation field is 100 yards long and 60 yards wide, but the game



At the left two players are "bullying" the ball to start the game. Each alternately strikes the ground and his opponent's stick three times, and then tries to drive the ball toward a teammate. At the right, a "White" player has scored by driving the ball into the goal past the "Black" goal-keeper.

is often played on smaller fields. The goals at each end are 12 feet wide and 7 feet high. In front of each goal is drawn a flattened semi-circle with a radius of 15 yards from the goal posts. A goal is scored only when the ball is sent into the goal by one of the attacking side from within this "striking circle."

A team consists of 11 players—5 forwards, 3 half-backs, 2 backs, and a goal-keeper. The game is divided into two halves not longer than 30 minutes each, and the teams change sides at the end of the half. The game is started by "bullying" the ball in the center of the field, as shown in the picture. When a player drives the ball over a side line, a member of the opposing team rolls it in by hand. When a ball is hit over the goal line, not between the goal posts, by an attacker, or is unintentionally sent over the goal line by a defender who is beyond the 25-yard line, it is put into play by "bullying." A ball struck over the goal line by a defending player within 25 yards of the goal line is set in play by the attackers at a corner.

Field hockey is a favorite game in girls' schools and colleges. Rules are prescribed by the American Physical Education Association and endorsed by the United States Field Hockey Association.

Ice hockey, the national winter sport of Canada, is also a popular game in the northern part of the United States. The American Amateur Hockey League was formed in 1896. A team has 6 men—goal-keeper, right defense, left defense, center, right wing,

and left wing. Instead of a ball, a "puck" is used—a flat circular disk of hard rubber, 1 inch thick, 3 inches in diameter. Shin-guards are usually worn under the stockings. The goal-keeper may wear leg-pads 10 inches wide. Carrying the stick above the shoulder or throwing it along the ice are prohibited.

TESTS OF SKILL IN FIELD HOCKEY



The game is played on an ice surface, preferably 200 feet long and 85 feet wide, with rounded corners and side boards at least 3 feet high. The goal "cages" are nets between posts 4 feet high and 6 feet apart, placed 10 or 15 feet from each end of the rink. A goal-keeper's "crease" is marked on the ice extending 5 feet into the rink on lines one foot outside each goal post. Attacking players must stay outside this crease unless the puck is inside. A goal is scored when the puck passes between the goal posts. The game lasts for three periods of 20 minutes each; but in case of a tie two extra periods of 10 minutes each are played, in an effort to break the tie. Fouls are penalized by sending the offending player from the game for from 2 to 5 minutes, and making his team continue play without his help.

HOG. To be likened to a hog or pig is looked upon as an unpardonable insult, because it is understood to imply either greediness or filthiness. Jews and Mohammedans regard the hog as "unclean" and unfit for human food. But the hog is no more greedy than any other animal. It does have a liking for mud baths, since it finds these soothing to its thick skin; but otherwise it prefers being clean, and thrives better when not kept in a "filthy pigsty."

We can judge the hog's value as a food animal from the fact that, even though several religions ban pork as a food, the hog still furnishes a large part of man's flesh food. From ancient times hogs have been maintained as "side lines" on farms, getting part of their living from otherwise useless food scraps, and rooting in field, meadow, and forest for the balance of the food they need. No other animal turns "waste food" into human food so efficiently.

The hog is admirably suited by nature for such use by man. Hogs and their relatives belong to the *Artiodactyla*, or division of hoofed animals having an even number of toes on each foot. Most of these animals, such as deer and cattle, have complex stomachs suited to fibrous vegetable foods (see Ruminants), and live on broad stretches of grass or forest land. The hog

has a simple stomach; and while it will eat anything, it thrives best on more concentrated vegetable food, such as cereals, roots, acorns, cooked kitchen scraps, and skimmed milk and other waste dairy products.

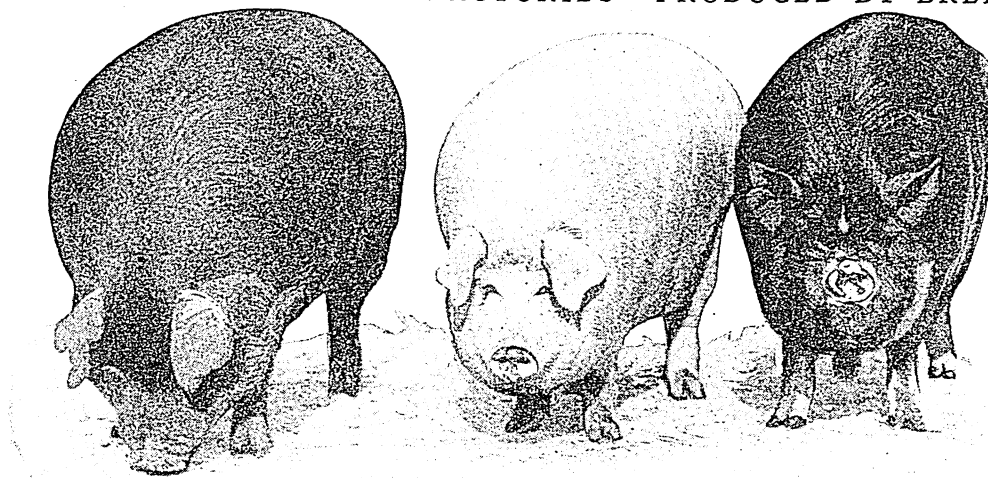
The head is well adapted to grubbing up roots and similar food. Except when domestic breeding has changed the shape of the head, the hog has a long snout with a fleshy button containing the nostrils on the end, where they can best sniff underground food. Each jaw has four tusks, all pointing upward, although domestic breeding has reduced the tusks in size. In wild hogs they aid in digging and self-defense. The neck is short and carries the head low. A hog's foot has four toes, two of them forming the hoof, and the outer two ending above the ground, except when the

therefore, at this age unless they are kept for breeding or to meet a special demand for heavy hogs. Mature hogs weigh from 600 to 1,000 pounds, depending upon sex and breed. "Porker" roasting pigs may be marketed when they are 4½ months old and weigh about 100 pounds.

Compared with cattle, hogs are more economical meat producers. The dressed carcass of a hog weighs 75 per cent of the live weight; a steer yields only 55 per cent. In nine months a sow may produce 1,500 pounds of finished pork and a litter of roasting pigs. In the same time a cow produces one calf that weighs 300 pounds when ready for market.

Every part of the hog yields food or some by-products. The bristles make brushes, and the hide makes a

THREE MARVELOUS "MEAT FACTORIES" PRODUCED BY BREEDING



Three famous breeds of swine, all of the lard type, are shown here. Left to right, they are Duroc-Jersey, Chester White, and Berkshire. The Berkshire is noticeable for its "dished face" with upturned nose, and ears that point up and a bit forward.

foot sinks into mud. Jelly-like tissue and soft muscle between the bones make "pig's-feet" a delicate food.

Occasionally the hog has been used as a draft animal. In China it is not rare to see a woman, a hog, a horse, and an ass harnessed together to drag a cart. An English hog-breeder once drove to a fair with four hogs drawing his carriage. Hogs can be trained to perform tricks, for they are quick to learn some things. In parts of Europe they are trained to find truffles, an edible underground fungus.

The Hog as a Food Producer

The hog is almost machine-like in the precision with which it gains weight from its food. Through a hog's normal life, 3.8 pounds of corn and two-fifths of a pound of tankage will increase the hog's weight one pound. American farmers figure on making a profit whenever they can sell 100 pounds of live hog for the price of 11.4 bushels of corn.

After hogs are between 6 and 10 months old, and from 175 to 225 pounds in weight, they gain flesh more slowly, and the flesh becomes too fat to cure into the best grades of ham and bacon. They are marketed,

therefore, at this age unless they are kept for breeding or to meet a special demand for heavy hogs. Mature hogs weigh from 600 to 1,000 pounds, depending upon sex and breed. "Porker" roasting pigs may be marketed when they are 4½ months old and weigh about 100 pounds.

Swine Multiply Rapidly

The females, called *sows*, may be bred when 8 or 10 months old, and after 16 weeks they produce litters of from 6 to 8 pigs. Subsequent litters may contain 10 or 12 pigs. The pigs are weaned in about two months; then they are called *shoats* or *shoters*. A mature male hog is called a *boar*.

Farmers usually expect two litters a year, about February and August. Most sows are clumsy mothers and usually kill some of the pigs by rolling on them and smothering them. Only about 56 per cent of all young pigs live to reach the market.

Breeds and Types of Hogs

The wild ancestors of the domestic hog appeared in many regions during prehistoric times. The domestic hog has the same scientific name (*Sus scrofa*) as the

European wild boar, which probably was its ancestor, with some crossing from Chinese varieties (*see* Boar). Perhaps hogs were first domesticated in China.

Modern domestic hogs are classed as either the lard type or the bacon type, with several breeds in each type. A bacon hog should have a long body, to yield the maximum amount of bacon from the sides; a lard hog has a shorter, stockier body, with more lard and larger hams. In either type the loins should be large, so that the upper hind legs will produce good hams; the less valuable head, neck, and fore-shoulders should not be unduly large. The best hams weigh from 12 to 16 pounds, the best sides of bacon from 10 to 12 pounds.

The principal American breeds are the reddish Duroc-Jersey, the black Poland China, spotted with white, and the Chester Whites. English breeds grown in the United States are the black Berkshires, the Hampshires with a white belt on the fore-shoulder, the reddish Tamworths; and the white Yorkshires. The last two are bacon hogs; the others belong to the lard type.

Many diseases attack swine. Most of these can be prevented by keeping the yards clean and the beds dry. Cleanliness, however, is of no avail against cholera; but science with its serums is bringing this disease under control. The former loss of some 130 to the thousand has been reduced to between 25 and 30; but the disease still causes losses of from 15 to 20 million dollars a year, depending upon hog prices. Another dangerous disease of hogs is caused by a parasite worm *trichina*, which lodges in the muscles. Men can acquire the infection by eating insufficiently cooked pork. Thorough cooking and federal inspection at packing plants are the chief methods for safeguarding people against these dreaded parasites.

Great Hog-Producing Regions

Hogs are raised everywhere in the United States, but principally in the corn states, to use this grain for fattening. Iowa leads in hog production with some 10 or 11 million head, more than one-sixth of the nation's swine. The United States normally produces about 60 million hogs a year, although government restrictions and short feed cut the number to

some 37 million in 1935. From one-fourth to one-fifth of the world's hogs are raised in the United States. China produces the greatest number—up to perhaps 90 million. The United States is next; Brazil,

Germany, and Russia follow with around 20 million head apiece. France leads the smaller producers, with about 6 million head. Poland, Spain, Canada, the British Isles, and Denmark, with about 3½ million head apiece, come next. The figures are averages since the World War, and account for over 80 per cent of all domestic swine.

The world export trade in pork products averages about 2½ billion pounds a year. Of this amount, the United States formerly furnished about half; but after 1929, its exports fell to about one-third of the world

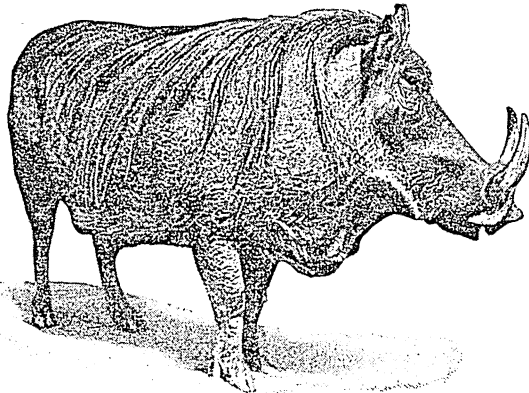
total. This loss was much less than that suffered by most of the country's exports. Because of the advantages of the United States, particularly its abundant crops of corn for fattening, pork is likely to continue to be one of the nation's leading farm exports. Pork is packed in nearly all parts of the country; the leading centers are Chicago, Kansas City, Omaha, East St. Louis, Sioux City, South St. Paul, and South St. Joseph. (*See* Meat Packing.)

Pork is commonly packed in brine for keeping, but the upper hind legs and cuts from the sides are smoked to make ham and bacon. In England, a "side" of bacon includes the fore-shoulder and ham, or gammon; American bacon is cut from the side only. Smoked pork is soaked in a solution of brine, sweetening, and soda-nitrate or nitrite (the "sweet western" cure), or the pickle is injected with a syringe. After 20 or 30 days of curing, the meat is smoked over a hard-

wood fire for a day or more. In dry curing, the meat is packed in a dry pickle, then soaked in water.

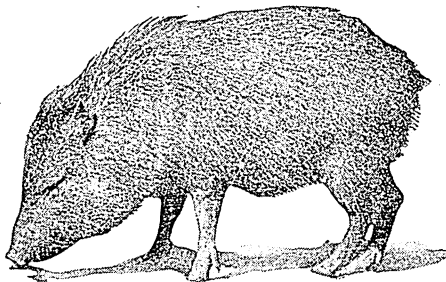
The sub-order of *Suina*, to which all swine-like creatures belong, is divided into three families: the *Suidae*, which includes hogs and wild boars, the *Tagassuidae*, which includes the fierce little peccaries, and the *Hippopotamidae*, the hippopotamus family. Among the interesting species of wild swine are the long-tusked *Babirussa* of the island of Celebes; the African wart hog, *Phacochoerus africanus*; and the river-hogs of the genus *Potamochoerus*, found in Africa and near-by islands. Peccaries are found in northern South America, Mexico, and as far north as Arkansas (*see* Peccary).

UGLIEST OF ALL THE HOGS



The Wart Hog of Africa is one of the oddest-looking animals in the world. That long face with those strange tusks is bad enough, but when you think that his features are further distorted by those curious wartlike bumps near his eyes and along his nose, it seems as though Nature had indeed played a joke upon this member of the hog family.

FIERCE LITTLE WARRIORS



Although the Peccaries are so small—only about three feet long—even jaguars learn to think twice before attacking them, for they go in herds and the team work with their sharp tusks is very effective.

A TRIUMPH OF WIT AND SATIRE ON CANVAS



This is one of Hogarth's masterly series of paintings called 'Marriage à la Mode', satirizing the follies of the fashionable life of his day. The sprawling viscount and his yawning bride sit amid the disorder left by a late party, while the old steward makes a gesture of dismay at the sheaf of bills he holds in his hand. In its beauty of light, color, and arrangement, this is one of Hogarth's most successful works. Another picture in this series is reproduced with the article Painting.

HOGARTH, WILLIAM (1697-1764). Few men have had so keen an eye for the expressions that the human face can register as did the English painter and engraver, William Hogarth. No artist has reproduced those expressions with more biting irony. Charles Lamb calls Hogarth "perhaps, next to Shakespeare, the most inventive genius which this island has produced." Hogarth was the first painter of genius born in England. All the great national artists before him were men who, like Van Dyck, had been born abroad.

Hogarth was primarily a humorist and satirist. He used paints and engraving tools as Molière and Fielding and Swift used words. He has been called a master of caricature, and he did contribute greatly to the development of technique in this field. But a caricaturist, in the modern sense of the word, usually ridicules individuals by exaggerating their conspicuous features. Hogarth rarely dealt with individuals. Rather, he made fun of humanity as a whole, satirizing without mercy its weaknesses and vices.

In his own day, however, many critics called Hogarth "vulgar" and thought his art inferior. Now he is generally placed high in the history of English

art for his masterful technique, his originality, his superb rendering of costume and setting, and, above all, for the vital humor and humanness of his characters. Most of his works are stories on canvas or copper, though he also did some excellent portraits.

As a boy, Hogarth showed a remarkable gift for mimicry and drawing. He tells us that his exercises at school "were more remarkable for the ornaments which adorned them than for the exercise itself." He was apprenticed to a silver-plate engraver and at the age of 22 set up as an engraver for himself. Soon he began to paint portraits and groups, and eventually found his true sphere in ridiculing human folly. His practise was to make a series of paintings and from them engravings, which were sold by subscription. Because printsellers shamelessly "pirated" his engravings, Hogarth was largely instrumental in securing the passage of an engraving copyright act.

Among Hogarth's famous works are the series 'The Harlot's Progress' (1731-32), 'The Rake's Progress' (1735), and 'Marriage à la Mode' (1745). The six original paintings of the latter are in London, as are the delightful 'Shrimp Girl', and portraits of himself and his sister. The Metropolitan Museum in New York has his portrait of Peg Woffington.

HOHENSTAUFEN. A German noble family of the Middle Ages to which belonged the Emperors from Conrad III (1138-1152) to Conrad IV (1250-1254) inclusive—with the exception of Otto IV (1198-1214), who was a member of the rival house of Welf (*see* Guelfs and Ghibellines). Castle Hohenstaufen, from which the family took its name, was in Swabia. The Hohenstaufen epoch was the most glorious period of medieval Germany, especially the reign of Frederick Barbarossa (1152-1190).

HOHENZOLLERN. The castle Zollern (or Hohenzollern), near the Danube River in Swabia (south-western Germany), was first built by one Count Frederick in the year 980 (rebuilt 1850-67). From him is descended the family which, after 1415, gradually raised Brandenburg-Prussia to the rank of a first-rate power in Europe, and in 1871 founded the German Empire. Frederick II and William II are the most notable members of the family. The castle also gives its name to the tiny province of Hohenzollern (441 square miles; an outlying part of Prussia) which surrounds it. (*See* Prussia.)

HOLBEIN (*hōl'bīn*), HANS (1497-1543). In the long ago days when Luther was drifting into his revolt against the Roman Catholic Church, Hans Holbein, a young German artist, left his father's studio in the wealthy old cultured city of Augsburg, to seek his fortune in Basel, Switzerland. His purpose was to furnish illustrations for the wonderful new printed books that were there being published.

The busy Rhine city of Basel boasted in those days "at least one learned man in every house." Among these scholars was the famous Erasmus, who had come to Basel to oversee the publication of the first printed edition of the New Testament in the original Greek, and other works which he had edited. This wise man and the young artist at once struck up a friendship and Holbein drew pictures for a very clever satire, called 'The Praise of Folly' (*Encomium*

Moriae), which Erasmus had written for relaxation and which his friends persuaded him to publish. The pictures were quite as clever as the text, and through all the 400 years since that time, whenever 'The Praise of Folly' has been reprinted, Hans Holbein's illustrations have been reprinted with it.

Holbein drew illustrations for many other books also, among them Martin Luther's translation of the Bible into German. He displayed great skill also in other lines. He painted pictures and portraits; he designed stained glass windows; he even drew designs for female costumes! The old saying that artists

HOLBEIN'S PORTRAIT OF THE KING'S ASTRONOMER



This picture of Nicholas Kratzer, astronomer to Henry VIII, is one of the great series of portraits made by Holbein during his stay in England. It is now in the Louvre.

are born and not made must have been true in the case of Holbein, for without a magic gift from some good fairy, he could hardly, at the early age of 20 years, have excelled in so many lines.

After a time religious strife between Catholics and Protestants became so bitter that life in Basel was most unsettled. Then Holbein, with a letter from his friend Erasmus to an Englishman of influence, again set out to try his fortune in a strange land. This time he went to London and there, thanks to Erasmus' letter, met with a favorable reception and later became court painter to Henry VIII. The king's fondness for Holbein has passed into a legend. When a nobleman complained of the favor shown the base-born artist, the king said: "My lord, know that of seven peasants I can easily make seven earls, but of the seven earls I cannot make one Holbein!"

In England Holbein was known chiefly as a painter of portraits. An old account of his services at the court of Henry VIII relates that he painted the portrait of the king, "life size, so well that everyone who looks is astonished, since it seems to live as if it

moved its head and limbs." The account continues: "He made portraits of the principal folk of the realm in such numbers that it is a matter for wonder how he could ever have finished so many!"

Although his life was spent in Switzerland and England, Holbein is regarded as a German artist. Comparing him with the other master artists of that nation, it is said: "Dürer was the greater genius, a greater thinker, a greater engraver, but Holbein was the greatest painter Germany has ever produced."

His paintings and drawings are found in most of the larger galleries of Europe. His 'Madonna', in the grand Ducal Palace of Darmstadt, is one of Germany's masterpieces. His most celebrated picture, is the portrait of his friend Erasmus, in the Louvre, Paris. The finest collection of the Holbein miniatures is the one in the possession of the Metropolitan Museum of New York City.

DAYS of CELEBRATION *the World* AROUND

HOLIDAYS AND FESTIVALS. Holidays have been observed in all ages and among practically all peoples. The Greeks had their Olympic games and many other festivals. The Romans celebrated Lupercalia in the spring and Saturnalia in mid-winter, marked by games, fantastic amusements, and the giving of presents. The earliest of all festivals seem to be connected with the dead, to whom offerings were made. Later, the sun and moon or the seasons were recognized by festivals; seed-time and harvest were occasions for special rejoicing.

All early festivals were in some measure religious. Thus the word holiday meant originally "holy day." Political holidays, celebrating historical events, were of later growth.

In some countries the gradual increase of holidays, national and local, has led to official regulation. In the United States there are no legal national holidays.

Congress does, however, name special holidays, and the various states can make them legal. In nearly all states New Year's Day (January 1), Washington's Birthday (February 22), Independence Day (July 4), Memorial Day (May 30 in the North, and April 26 or

May 10 in most Southern states), Labor Day (first Monday in September), Armistice Day (November 11), Thanksgiving Day (usually the last Thursday in November), and Christmas (December 25) have been declared legal holidays by the state legislatures.

Independence Day, the Fourth of July, is of course America's greatest patriotic holiday. From the begin-

ning of the Republic, the "Fourth" and several days before it have been marked by continuous explosions of torpedoes, firecrackers, and other noise-makers, as well as by colorful displays of fireworks (see Fireworks). For many years these explosives took a heavy toll of life, but the "Sane Fourth" idea of later years has greatly lessened the casualties. Patriotic organizations, clubs, and communities now bring hundreds, or perhaps thousands, of people together to celebrate at a joint festival; and the fireworks

exhibitions are under the direction of experts. Many cities forbid the indiscriminate sale of firecrackers.

Holidays which have no legal status include Valentine's Day (February 14), April Fools' Day (April 1), May Day (May 1), and Hallowe'en (October 31).

THE FIRST THANKSGIVING



With Chief Massasoit and his tribesmen as guests, the Pilgrim Fathers, in October 1621, celebrated their first harvest festival. The vegetables came from their own gardens; the meat was wild fowl from the forests.

In Canada these legal holidays are observed: Dominion Day (July 1), New Year's Day, Good Friday, Easter Monday, Christmas Day, Empire Day (May 24), Labor Day, and the birthday of the reigning sovereign.

Other days celebrated by special community and school programs in many states are: Lincoln's Birth-

day (February 12), Arbor Day (fixed by governor), Mothers' Day (second Sunday in May), Flag Day (June 14), and Columbus Day (October 12).

For "state days" celebrating the entrance of a state into the Union or its ratification of the United States Constitution, see table with the United States article. For list of birthdays and other anniversaries which are sometimes observed in the schools, see Anniversaries in Fact-Index.

Occasions Generally Observed in the United States

ALL the states, territories, and possessions of the United States observe certain holidays and festivals; others also celebrate events of special local significance or honor the memory of notable persons, either who were born or who lived within their borders. Many of these celebrations are observed principally in the schools. A rapidly growing literature on the materials and methods for observing these special days is now a feature of nearly every library. When observances are not national in scope, the following list indicates in *italics* the states or cities where the anniversary is of chief interest.

January

1. New Year's Day.
8. Battle of New Orleans (1815). Andrew Jackson and his frontiersmen defeated British forces engaged in War of 1812. *Louisiana.*
11. Alexander Hamilton's Birthday (1757). *New York.*
- 17-24. Thrift Week. Many agencies, both commercial and educational, cooperate to teach the meaning and methods of thrift during this week. The week begins on the anniversary of Benjamin Franklin's birth, in recognition of the fact that he was a great advocate of thrift. (*See Thrift.*)
18. Daniel Webster's Birthday (1782). *Massachusetts.*
19. Robert E. Lee's Birthday; also Lee-Jackson Day (1807). *Southern states.*
20. Inauguration Day (every fourth year). *District of Columbia.*

February

2. Candlemas (also Groundhog Day). Candlemas is a Christian festival that since the 11th century has marked the blessing of candles for church use. This date is also popularly known as Groundhog Day (*see Groundhog*).
11. Thomas A. Edison's Birthday (1847). *Most states.*
12. Lincoln's Birthday (1809).

PIPING IN THE CHRISTMAS PUDDING



To the skirl of bagpipes, these Scottish youngsters observe the ancient Christmas custom of ushering in the plum pudding.

12. Oglethorpe Day (1733). Gen. James Edward Oglethorpe established Colony of Georgia at Savannah. *Georgia.*

14. Saint Valentine's Day (*see Saint Valentine's Day*).

15. Battleship Day. The blowing up of the *Maine* in the harbor of Havana, with the loss of 264 lives, was one of the events that led to the Spanish-American War. *Maine.*

22. Washington's Birthday (1732).

25. Capture of Vincennes (1779). British influence in Middle West was crushed with defeat of English forces by George Rogers Clark and his Virginia riflemen. *Indiana.*

March

2. Independence Day (Sam Houston Memorial Day) (1836). Texas declared its independence from Mexico. Houston was its great general and first president. *Texas.*

6. Siege of the Alamo (1836). Fortified Franciscan mission, "The Alamo," which was defended to the last man by its garrison of Texans, captured by Mexicans. *Texas.*

7. Luther Burbank's Birthday (1849). *California.*

17. Evacuation Day (1776). British forces, imperiled by Washington, left Boston. *Boston, Mass.*

25. Maryland Day (1634). Roman Catholic mass celebrated for first time in Maryland colony. *Maryland.*

30. Alaska Purchase (1867). *Alaska.*

April

1. April Fools' Day. The custom of playing pranks on this day is so old that its origin is uncertain. (*See April.*)

6. Army Day. The achievements of the army are emphasized in schools and special gatherings.

9. Appomattox Day (1865). Lee surrendered to Grant.

14. Pan American Day. On this day, in 1890, a resolution was adopted resulting in the Pan American Union. Commemorates the friendship of the 21 American republics.

18. Paul Revere's Ride (1775). *Massachusetts.*

19. Patriots' Day (1775). Anniversary of Battle of Lexington and Concord. *Massachusetts; Maine.*

21. Battle of San Jacinto (1836). Mexicans defeated by General Houston. *Texas.*

May

1. May Day. This ancient festival is celebrated by Maypole dances and other gala activities (*see May*).

1. Child Health Day. First set aside by President Hoover in 1930 to encourage child welfare work.

13. Settlement of Jamestown (1607). *Virginia.*

18. Peace Day, or World Good-will Day. On this day in 1899, the first international conference for world peace met at The Hague (*see Hague Peace Conferences*).

22. Maritime Day. On May 22, 1819, the steamship *Savannah* began the first successful transatlantic voyage by steam.

30. Memorial Day or Decoration Day. This day marks tributes, by special exercises and the decorating of graves, to soldiers and sailors in all the wars of the United States. Some Southern states observe it on April 26 or May 10. In 1868, Gen. John A. Logan, commander in chief of the Grand Army of the Republic, designated this day for the decoration of the graves of the dead Union soldiers. Congress has never made it a national holiday, but it is a legal holiday in all the Northern states. The idea of a memorial day originated in Columbus, Ga., where formal exercises were held at Linwood cemetery, April 26, 1866. The custom was soon followed elsewhere. No one date has been adopted by all states. May 30 may have been adopted in the North

because that was the date of the discharge of the last Union volunteers. (See Memorial Day.)

June

11. Kamehameha Day (1760?) Birthday of first king. *Hawaii.*

14. Flag Day. Exercises on this day mark the adoption of the Stars and Stripes as the flag of the United States by the Continental Congress in Philadelphia, 1777. The flag is displayed both in homes and public places. Flag raising ceremonies, instruction in flag etiquette and history, as well as parades and pageants especially in Americanization programs, are important features of many observances. This is a legal holiday in some states.

15. Pioneers' Day. *Idaho.*

17. Bunker Hill Day (1775). *Massachusetts.*

23. Penn Treaty with Indians (1683). *Pennsylvania.*

July

4. Independence Day. The Declaration of Independence from Great Britain was passed by the Continental Congress at Philadelphia. Pennsylvania, in 1873, was the first state to make this occasion a legal holiday. However, there is a record of its observance by the citizens of New Bern, N. C., in 1778, and it was celebrated elsewhere before the action of Pennsylvania was followed by all the states.

4. Providence founded (1636). *Rhode Island.*

24. Pioneers' Day. *Utah.*

August

16. Battle of Bennington (1777). Green Mountain Boys defeat British. *Vermont.*

19. National Aviation Day. Observed with appropriate exercises to stimulate interest in aviation.

September

12. Defenders' Day (1814). Defense of Baltimore in War of 1812. *Maryland.*

17. Constitution Day (1787). The Constitutional Convention, which had met in Philadelphia on the call of Congress, adopted the United States Constitution on this day.

22. Emancipation Day (1862). Lincoln read Emancipation Proclamation.

29. Leif Ericson Day (1000). Norsemen under Ericson's leadership reached the American continent.

October

9. Fire Prevention Day. This is the anniversary of the beginning of the fire that wiped out most of Chicago in 1871. Many states now observe the day by programs to show the hazards of fire and methods to avoid it.

12. Columbus Day (1492). Celebrates the landing of

CELEBRATING THE JAPANESE RICE FESTIVAL



Harvest time down the ages in all lands has been a season of rejoicing. Here the Japanese are seen celebrating the feast of Mochi, the annual rice festival, their hats in strange contrast with the symbolical float they are drawing.

A CARNIVAL BEFORE LENT



Shrove Tuesday, ushering in the Lenten season, is the occasion of a colorful fête in the old Belgian town of Binche, where clowns or gillies parade the cobbled streets with bells and feather plumes, tossing oranges to the crowds along the way.

Columbus at San Salvador; observed not only in the Americas but also in Spain and Italy.

17. Burgoyne's surrender (1777). *New York.*

19. Cornwallis' surrender (1781). *Virginia.*

27. Navy Day and Roosevelt Day. The achievements of the navy and the part that it plays in the defense of the United States are emphasized in schools and special gatherings. This date is also the birthday of Theodore Roosevelt, who, as assistant secretary of the navy at the outbreak of the Spanish-American War and later as president, did much to strengthen this arm of the national defense.

30. John Adams' Birthday (1735). *Massachusetts.*

31. Hallowe'en. This festival with its merry pranks has been observed for over 2,000 years. (See Hallowe'en.)

November

11. Armistice Day (1918). German representatives at Senlis, France, signed the armistice that brought to a close the World War on this date in 1918 at 5 a.m.; hostilities stopped at 11 a.m. (see Armistice). The day is observed also in Canada and other nations. It is customary in the United States to halt work at 11, face east, and stand for one minute in silent tribute to World War heroes.

December

21. Forefathers' Day (1620). *Mayflower* reached Plymouth. *New England states.*

25. Christmas Day (see Christmas).

30. Rizal Day (1896). José Rizal, Filipino patriot, executed. *Philippines.*

Special Occasions on Varying Dates

Child Labor Day. Last Sunday in January. On this day, educational programs relating to child employment are given by churches, clubs, schools, and other organizations.

Shrove Tuesday (Mardi Gras). On this day, which is the last before the beginning of Lent, the Mardi Gras festival at New Orleans comes to a gala close. (*Ala., Fla., La.*)

American Forest Week. Last week in April. In 1921,

President Harding issued the first proclamation for this week, which is to develop interest in forestry conditions.

Mother's Day. Second Sunday in May. Mothers are honored on this day by special exercises and by messages, gifts, and visits from their children. It has been generally observed since 1914, when Woodrow Wilson issued a proclamation calling for its celebration and the displaying of the flag on all public buildings. The idea was the inspiration of Miss Anna M. Jarvis, of Philadelphia, who in 1907, on the first anniversary of her own mother's death, arranged for a special church service to pay tribute to all mothers. Mother's Day is also celebrated in many foreign countries.

I Am an American Day. Third Sunday in May. A day for the recognition of all who have become citizens by coming of age or by naturalization within the year was first set aside in 1940.

Children's Day. Second Sunday in June. Many churches observe this occasion by special sermons, and programs of pageants and plays in which children often have a part. It dates back to 1856, when the Universalist Church of the Redeemer, Chelsea, Mass., held a special children's service.

Father's Day. Third Sunday in June. First celebrated in Spokane, Wash., in 1910, at the suggestion of Mrs. John B. Dodd, this day is now observed in most states.

Labor Day. First Monday in September. This holiday began with a labor parade in New York City on Sept. 5, 1882. It has been adopted by all the states and territories and by Canada. In many foreign countries labor organizations celebrated May 1 as a holiday and a day for demonstrations.

Indian Day. Fourth Friday in September. Illinois and some other states have set aside this day for special exercises in the schools relating to the history of the Indian in North America and his admirable qualities.

Gold Star Mother's Day. Last Sunday in September. Honors the mothers who lost sons and daughters in the World War.

Education Week. About Nov. 18-24. To emphasize the importance of the public schools, many organizations, such as parent-teacher associations and community clubs, observe each day of the week by special programs on varied phases of education. The practise of setting aside a week for this purpose was started by Dr. P. P. Claxton in 1920, during his term as commissioner of education.

Thanksgiving. Usually the last Thursday in November. This is the American harvest festival. For its history, see Thanksgiving.

Arbor Day. By proclamation of governors on various dates. This is an occasion for planting trees and emphasizing their beauty and utility. For its history, see Arbor Day.

Foreign Holidays and Celebrations

EPOCH-MAKING events and personalities are observed by holidays in various nations. Racial groups away from their native land frequently observe these days by special programs.

January (between January 20 and February 19). Feast of Lanterns (China). This feast concludes the two weeks' celebration that ushers in the Chinese New Year. It is made picturesque and noisy by lanterns and firecrackers.

March 1. St. David's Day (Wales). In honor of their patron saint, the Welsh wear the leek on this day.

March 3. Doll Festival (Japan). During this attractive three-day national festival for girls, elaborate sets of dolls are displayed in the homes (see Japan).

March 17. St. Patrick's Day (Ireland). The observance of the death of Ireland's patron saint is marked by the wearing of the shamrock (see Patrick, Saint).

April 23. St. George's Day (England). The martyrdom of England's patron saint was at first observed by the wearing of a red rose (see George, Saint).

May 1. The Day of the National Work (Germany), official Nazi holiday.

May 5. Feast of Flags (Japan). During this festival for boys, banners and flags are displayed (see Japan).

May 17. Independence Day (Norway). On this day in 1814 the Norwegians adopted their first constitution.

May 24. Empire Day (British Dominions). The anniversary of Queen Victoria's birth in 1819.

June (fifth day of the fifth moon). Dragon Boat Festival (China). During this festival, boatmen race along the many rivers of China in mock search for the body of Ku-Yuan, a statesman, who was drowned about 2,400 years ago. The day also marks efforts to placate the deity of the streams, the Dragon, so that the rivers will not overflow. Each boat carries on its prow an image of the god. Associated with this festival also are ceremonies to prevent the ravages of the "five insects," as they are called, the toad, viper, spider, centipede, and scorpion (for picture, see China).

June 5. Constitution Day (Denmark). On this date in 1849, Denmark became a constitutional monarchy.

June 24. Bannockburn Day (Scotland). On this date in 1314, Robert Bruce drove the English out of Scotland and gained independence for the country (see Bruce, Robert).

July 1. Dominion Day (Canada). Province of Canada, Nova Scotia, and New Brunswick united as Dominion of Canada, 1867.

July 4. Garibaldi Day (Italy). "The knight errant of Italian unity" was born on this date in 1807.

July 5. Independence Day (Venezuela). Under the leadership of Francesco Miranda as dictator, Venezuela declared itself free from Spanish rule on this date in 1811.

July 6. John Huss Day (Bohemia). John Huss met a martyr's death on this day in 1415 (see Huss, John).

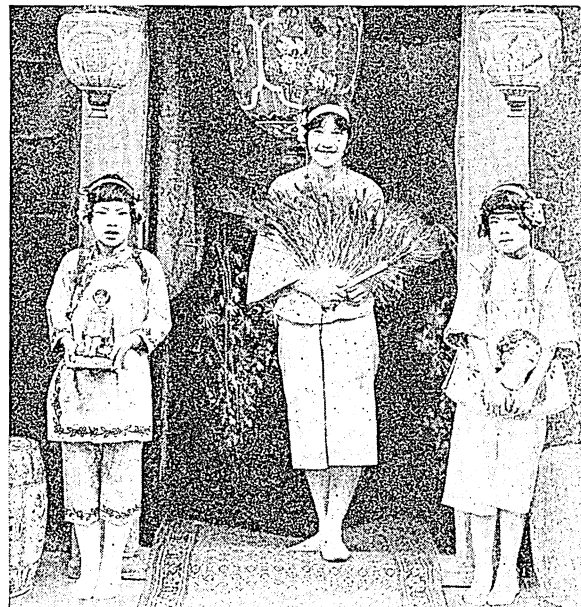
July 9. Independence Day (Argentina). A revolutionary congress in 1816 declared Argentina's independence.

July 14. Bastille Day (France). The storming of the Bastille as a protest against the royalist government in 1789 marked the turning point of the French Revolution.

July 21. Independence Day (Belgium). On this day in 1831 Leopold entered Brussels as king of Belgium following the separation of that country from Holland.

July 28. Independence Day (Peru). Peru became independent of Spanish rule in 1821.

THE FEAST OF LANTERNS



Bringing the Chinese New Year period to a close. This feast provides a gay spectacle. This young woman with her two small attendants is queen of a celebration in San Francisco's Chinatown.

July 29. St. Olaf's Day (Norway). As king of Norway, St. Olaf established Christianity there and endeavored to achieve national unity. He was killed in battle in 1030 and became the nation's patron saint in 1164.

August (first Monday). Bank Holiday (England). Other bank holidays established by the Act of 1871 are Easter Monday, Whit-Monday, and Boxing Day (December 26). All banks close, and all business is suspended.

Aug. 6. Independence Day (Bolivia). On this day in 1825 Bolivia declared its independence of Peru.

Aug. 10. Independence Day (Ecuador). The first blow for independence from Spain was struck on Aug. 10, 1809.

Sept. 7. Independence Day (Brazil). Freedom from Spanish rule was declared by Brazil on this day in 1822.

Sept. 11. Harvest Festival (England).

Sept. 15. Independence Day (Central American Republics). Spanish rule was overthrown by these republics in 1821.

Sept. 16. Independence Day (Mexico). On this date in 1810, Miguel Hidalgo, a parish priest, rang the bell of his church and urged the independence of Mexico from Spain. The revolt that he started ended successfully in 1822.

Sept. 18. Independence Day (Chile). Chile rose against Spanish rule on this day in 1810.

Sept. 20. Unification Day (Italy). On this date in 1870, the Italian forces entered Rome, establishing national unity.

Oct. 10. Independence Day (China). Revolts that led to the establishment of the republic began on this date in 1911.

Oct. 31. Posting of Luther's Theses (Germany). On this date in 1517, Martin Luther posted his 95 theses.

Nov. 3. Independence Day (Panama). Panama declared its independence of Colombia on Nov. 3, 1903.

Nov. 5. Guy Fawkes Day (England). The plot of Guy Fawkes to blow up King James I and his Parliament was discovered on this day in 1605 (see Fawkes, Guy).

Nov. 9. Lord Mayor's Day (England). An elaborate parade and show marks this occasion, on which the Lord Mayor of London takes his oath of office.

Nov. 10. Luther Day (Germany). Celebrations are held by Protestants on the birthday of Martin Luther (born 1483).

Nov. 11. Martinmas (Germany and England). This ancient festival, which was observed by the Romans as Vinalia, the celebration of the vintage season, is now in honor of St. Martin, the patron saint of reformed drunkards. In England it marks the day for the hiring of servants at large community gatherings. Fair weather at this season is called St. Martin's summer.

Nov. 16. Gustavus Adolphus Day (Sweden). "Sweden's greatest king" met his death on this date in 1632 in the battle of Lützen.

Dec. 31. Hogmanay Day (Scotland and northern England). This is observed by exchanges of gifts among the older people and gifts of cakes to children in return for their songs. The word "hogmanay" is supposed to be derived from an old French term for new year.

RELIGIOUS OBSERVANCES AND FESTIVALS

Jan. 6. Epiphany

March 25. Annunciation

Aug. 6. Transfiguration

Dec. 8. Immaculate Conception

Some Famous Saints' Days

Apr. 25. St. Mark.

Apr. 30. St. Catherine of Sienna.

May 16. St. Joan of Arc.

June 5. St. Boniface.

June 13. St. Anthony.

June 24. St. John the Baptist.

Aug. 15. Assumption

Nov. 1. All Saints

Nov. 2. All Souls

June 29. Sts. Peter and Paul.

July 15. St. Swithin.

July 25. St. James the Great.

July 25. St. Christopher.

Sept. 21. St. Matthew.

Oct. 18. St. Luke.

Nov. 22. St. Cecilia.

Nov. 30. St. Andrew.

Movable Feasts and Fasts

Shrove Tuesday. Tuesday before Lent.

Ash Wednesday. First Day of Lent.

Lent. Period of forty days, not including Sundays, and ending with Easter.

Palm Sunday. Sunday before Easter.

Maundy Thursday. Thursday before Easter.

Good Friday. Friday before Easter.

Easter Sunday. First Sunday after the first full moon after the vernal equinox (see Easter).

Ascension Day. Forty days after Easter.

Whitsunday or Pentecost. Fifty days after Easter.

Trinity Sunday. Sunday after Whitsunday.

Corpus Christi. Thursday after Trinity Sunday.

Jewish Holidays

Passover. March or April.

Pentecost. Fifty days after Passover.

Rosh Hashana (New Year). September or October.

Yom Kippur (Atonement). September or October.

Feast of Tabernacles. September or October.

Hanuka or Feast of Dedication (Feast of Light). About winter solstice (December 21).

Purim (drawing of lots). Usually in March.

HOLLAND. This name properly belongs to two western provinces of the Kingdom of the Netherlands—North Holland and South Holland. They are the most densely populated of the eleven provinces, and contain many of the largest cities—Amsterdam, Rotterdam, The Hague, Haarlem, and others. The land is below sea level and is protected by dikes. Because of the historic, economic, and political importance of the two provinces, the name "Holland" is frequently applied to the whole Kingdom of the Netherlands. (See Netherlands, Kingdom of.)

HOLLY. When the Christmas season approaches, each home puts on its gala attire, and sprigs of holly adorn the chandelier and hang in wreaths in the windows. The bright red berries, conspicuous among the dark green prickly leaves, add a cheery note to the occasion. There are about 175 species of holly shrubs and trees, distributed throughout the world, all evergreens. In some of the species the leaves are blackish and they bear yellow or black berries.

In North America the holly is abundant on the bottom lands of eastern Texas and Arkansas, but it also occurs on the Atlantic coast from Massachusetts to Florida and in the Mississippi Valley. The American holly sometimes forms a tree 50 feet in height. It is from this species that much of the commercial holly is taken. The European holly, which is even more beautiful than the American, is cultivated as a garden shrub, in America as well as in England. The close-grained white wood is admirably adapted to cabinetwork.

Scientific name of American holly, *Ilex opaca*. Bark, light gray and smooth. Leaves simple, alternate, elliptical or oval, with pointed apex and base, having sharp, spinelike teeth. Fruit a small bright red berry which remains on the tree far into the winter.

HOLLYHOCK. Clothed with dark green leaves and thickly studded with large bright-hued blossoms, the tall stalks of this treasured old-fashioned plant make a beautiful and stately border for our gardens. Reaching a height of six or eight feet, its spikes stand

in soldierly array, seeming to guard the more modest blossoms that cling closely to Mother Earth.

The hollyhock has been developed from the wild mallow, a native of Syria. It is believed to be the "holy mallow" discovered by the Crusaders and brought to Europe by way of Palestine. Originally it had single rose colored blossoms, but through centuries of cultivation numerous varieties of both double and single flowers have been produced, in many shades of pink and purple, as well as in yellow and white. The glory of the hollyhock has declined of late years because of a very destructive fungus which attacks the plant, making difficult of production the blossoms that once adorned the stalks to within two feet of the ground. The presence of this fungus is first indicated by small spots appearing on the stems and leaves of the plant. Soon afterward the leaves begin to look dry and scorched.

Scientific name, *Althaea rosea*. Flowers about 3 inches across, growing on short peduncles from the stalk; calyx 5-pointed, reinforced by a circle of 6 to 9 bracts; petals 5 in number, large, wedge-shaped, convolute in bud; stamens numerous, united in a tube; styles numerous. Stem tall, thick, hairy. Leaves 5 to 7-lobed, rough, rounded, heart-shaped.

HOLMES, OLIVER WENDELL (1809-1894). When James Russell Lowell chose Holmes to be the first prose writer for the new *Atlantic Monthly* (1857) he declared confidently: "The success of this magazine rests with Dr. Holmes. He has written little, but you'll see. His mind is like a bright mountain stream that has been dammed up in the hills, waiting only an outlet to the ocean. He has a wonderful store of thought—serious, comic, pathetic, and poetic." The delightful essays entitled 'The Autocrat of the Breakfast Table' proved Lowell a true prophet, for nothing so witty and wise, so humorous and kindly, had been produced in America. In whatever he wrote, Holmes showed a boy's freshness, a man's energy and purpose, a poet's gift, and the high moral tone that marked the work of the great New England writers of his day. And in putting his thoughts on paper he lost none of the sparkle and personal charm that made him a celebrity as conversationalist and lecturer.

Dr. Holmes' success as a writer was the more remarkable because writing was not his chief business. He was a busy physician and Harvard professor, who, besides caring for his big practice, made original scientific investigations and wrote medical works. He was born in Cambridge, Mass. His father was a Congregational minister, professor at Harvard, and historian. Holmes himself had the advantages which he said belonged to a man of family—namely, "four or five generations of gentlemen and gentlewomen" back of him, and "the tumbling about in a library as a child." His life was a busy and uniformly successful one, free from startling events or great mis-

fortunes. After his college days at Harvard he had studied law; then he had taken up medicine, studying in Boston and in Europe.

His fame as a writer began while he was still in college, with his poem 'Old Ironsides', that saved the old frigate *Constitution* from destruction. The volume that contained the funny 'My Aunt' and the inimitable humorous-pathetic 'Last Leaf' appeared the year that he took his M.D. degree at Harvard. So often was Holmes called upon for verses for special occasions that he has been called the poet laureate of Boston. The reputation that his 'Autocrat of the Breakfast Table' brought him never dimmed. He followed those essays with 'The Professor at the Breakfast Table' and 'The Poet at the Breakfast Table', and found time also to write two novels. Not all Holmes' poetry was humorous, as was 'The Wonderful One-Hoss Shay'. Some

of it was beautiful and inspiring, like 'The Chambered Nautilus', one of the most widely quoted of poems.

Holmes was greatly loved, for he was wise and witty and at the same time cheerful and kind. He could share his culture with people without showing the slightest hint of chilling superiority. He received many honors both in his own country and in Europe.

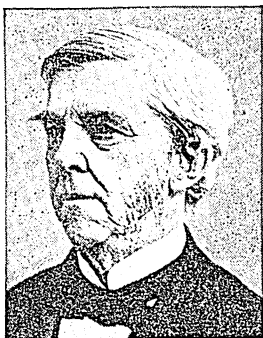
Principal works: *Books of poems*—'Songs in Many Keys' (1861); 'Songs of Many Seasons' (1874); 'The Iron Gate' (1880). *Novels*—'Elsie Venner' (1861); 'The Guardian Angel' (1867). *Essays*—'The Autocrat of the Breakfast Table' (1857-58); 'The Professor at the Breakfast Table' (1859); 'The Poet at the Breakfast Table' (1872); 'Over the Teacups' (1891). *Memoirs*—'Memoir of John Lothrop Motley' (1879); 'Life of Ralph Waldo Emerson' (1884).

HOLMES, OLIVER WENDELL (1841-1935). As a member of the United States Supreme Court for 30 years (1902-1932) this namesake of his poet father brought literary ability and human insight to the service of the law. After serving in the Civil War, he finished study at Harvard, and was admitted to the bar in 1867. He edited *The American Law Review* from 1870 to 1873 and published his notable book 'The Common Law' in 1881. In 1882 he became associate justice of the Massachusetts Supreme Court and in 1899 its chief justice.

HOLY ROMAN EMPIRE. It was on Christmas Day of the year 800, when Pope Leo III in the church of St. Peter's in Rome placed a crown on the head of the Frankish king Charlemagne as he knelt in prayer, that the peculiar organization which we call the Holy Roman Empire first came into existence (see Charlemagne). Amid the breakup of the Frankish kingdom after Charlemagne's death, the Empire for a time disappeared. It was revived by the Saxon Otto I, king of Germany, in 962. From that time until its final abolition in 1806, the Empire maintained some sort of existence; but in its last three centuries it had become, in the language of the witty Frenchman Voltaire, "neither holy, nor Roman, nor an empire."

In theory the Holy Roman Empire was the counterpart in civil government of the universal Catholic

OLIVER WENDELL HOLMES



"The Autocrat of the Breakfast Table"

church in religion. Just as God had placed the pope over his church, so, it was reasoned, he had placed the emperor over all kings and princes. In practise the Empire after 962 included only Italy and Germany, and a wavering connection with Lorraine, Burgundy, Switzerland, and the Netherlands.

In theory the Empire was elective. The Golden Bull of 1356, issued by the Emperor Charles IV, placed the hereditary right to elect in an Electoral College composed of the archbishops of Mainz, Cologne, and Treves (Trier), the King of Bohemia, the Count Palatine of the Rhine (Pfalzgraf), the

Duke of Saxony, and the Margrave of Brandenburg (Bavaria and Hanover were added later). In practise the election was practically hereditary. After the Carolingian and Saxon lines, the imperial crown was worn by the members of the following houses: The Franconian or Salian house (1024-1125), the Hohenstaufen (1125-1254), [Great Interregnum, 1254-1273], various houses (1273-1347), the Luxemburg-Bohemian line (1347-1437), the Hapsburgs (1438-1806, except for one reign, 1740-1745). For further details see the article Germany and the biographical articles.

An ANCIENT ART Transformed into a MODERN SCIENCE

HOME ECONOMICS. From the earliest days of civilization, man's home has been one of his strongest interests, vitally bound up with his well-being and happiness, involving also his pride, his joy of possession, his deep unselfish concern for his family. Long before there were cities or industries or any of the multiple interests of modern life, man was aware of the meaning of home—a cave at the end of the hunt, a primitive shack in the forest clearing. And for woman, throughout the ages, home has been the focal point of concern and activity.

We might expect, then, that the science which deals with the home—called home economics or domestic science—would have been one of the earliest of all fields of knowledge to develop. But, strangely enough, this was one of the latest to gain recognition as a special science. Not until 50 or 60 years ago did this science, as an independent branch of learning, come into existence. Ellen H. Richards (1842-1911), pioneer of the home economics movement, formed the first home economics association in 1908 to promote the study of the subject in schools.

Before that, knowledge about home making had no laboratory save the home itself. Choice recipes were handed down in families. Mothers taught their daughters how to clean, to cook, to sew. The bride patterned her home after her mother's home and managed it as her mother had taught her.

But as home making changed with the rapidly changing world, this plan became inadequate. Family traditions are little help to the modern homemaker, who deals with a hundred new factors in housekeeping of which her grandmother never heard—electrical and mechanical devices, new systems of marketing, new foods, and new methods of preparing and marketing them. Home making now is far more interesting and far less enslaving, more complicated and yet easier than it ever was before.

So to meet these new conditions we have the science of home economics. It has become very exact and far reaching. The Bureau of Home Economics of the Department of Agriculture conducts surveys to learn the length of time spent on household tasks by women in various types of homes. It studies their division of the family budget among the various home needs. It

also tests foods, textiles, and household equipment, recommending the best and most economical. Schools, laboratories, books, newspapers, magazines, the radio, and countless mechanical inventions all try to help the homemaker.

This science goes over at many points into the realm of art. The homemaker must know about colors and fabrics, pictures and bric-à-brac, furniture and carpets, together with such details as the attractive display of food and the arrangement of flowers. It touches very deeply the welfare of the world, for home training has been called the mainspring of all effort for the betterment of humankind. Since women do most of the buying of commodities, home making has an important bearing on business and industry. In short, it is a field of almost unlimited scope and interest.

But for purposes of effectiveness home economics has been organized to cover only certain related subjects, such as shelter, food, clothing, home management, child care, and family relationships. Shelter involves all the many aspects of our living conditions. One who has studied it plans a house or chooses an apartment wisely, with regard for location, convenience of arrangement, proper lighting, plumbing, heating, and waste disposal. Living conditions have been found to affect vitally the character and the mental qualities of people, as well as their health. There should be adequate sunlight, adequate privacy, and a measure of tasteful beauty to enrich our lives. Experts have established standards for these things, and they are taught in home economics courses.

Interior Decoration an Established Vocation

Interior decoration is another aspect of shelter. It has become in itself an elaborate study and an established vocation. The simpler phases of this study include the choice of furniture, draperies, floor coverings, lamps, linens, pictures, and other articles. They offer a guide to good taste for the person who is furnishing a home. More advanced interior decoration includes the study of textiles, of period furniture, art objects, tapestries, and the creative use of colors and materials in beautiful and appropriate interiors.

The question of food has many angles in addition to mere cooking. Every year brings new evidence of

the relation of health to diet. To plan meals which provide the necessary elements the housewife must know the chemical content of food. There has been a remarkable education of the public along this line in the past few years, and now almost everyone knows what calories are and that orange juice contains healthful vitamins.

The Work of the School

In the home economics school, the student learns the functions of all foodstuffs—how carbohydrates and fats furnish the heat and energy, how proteins build muscle and sinew, the regulating effect of water and roughage, the work of minerals in body building, and the part vitamins play in growth and the prevention of disease. She learns how to market wisely to get these nutrients in the best and most economical form, how to prepare them to retain their beneficial qualities, how to preserve them, and how they are properly balanced in a nourishing diet. She also learns how to prepare foods with the least possible waste and how to "save steps" in cooking; how to set a table attractively and how to serve meals properly.

phase of the selection, manufacture, and care of clothing. Whether a woman has studied costume design, millinery, tailoring, and the like, and can make smart clothing herself, or whether she buys the family outfit ready made, she must be able to judge textiles, leathers, felts, furs, and other materials to get the best possible values. Home economics teaches her the characteristics of various fibers and weaves, and tests for adulteration and "loading" in cloth; and it gives her a knowledge of manufacturing processes that enables her to detect poor products and poor methods.

Home Management and the Budget

Every branch of home economics involves home management in its broadest sense. In home economics courses, however, a home-management unit is usually taught, separate from foods and clothing work. It may include shelter—that is, the planning and furnishing of the home—in addition to the actual management of household affairs, which has to do with budgets, household accounts, time schedules, the buying of household supplies, cleaning and care of the house, child care, home nursing, and laundry work.

No department of this science indicates more clearly the trend of modern life toward organization than the one which deals with family expenditures. Experts have figured out what percentage of the family income should be spent for food, for clothing, for shelter, and for all the other things necessary to well-rounded family life. They have made budgets which may be adapted to the needs of families of any size in any circumstances. Each family's budget, however, depends on its tastes as well as on income, so adjustments have to be made to these calculations of experts, in accordance with past expenditures as determined by the keeping of household accounts. Accounts must be kept under the budget system, of course. Banks, insurance companies, magazines, and department stores often furnish blanks to be used for home bookkeeping. Home economics authorities advise that the entire family be consulted in making the

SOME SUGGESTED HOUSEHOLD BUDGETS

	No. in Family	\$100 per Month	\$200 per Month	\$300 per Month	\$400 per Month	\$500 per Month
		Actual % of Money Total	Actual % of Money Total	Actual % of Money Total	Actual % of Money Total	Actual % of Money Total
FOOD	2	30 30	40 20	45 15	50 12.5	50 10
	3	37 37	50 25	55 18.3	65 16.3	65 13
	4	44 44	60 30	65 21.7	75 18.7	75 15
	5	50 50	65 32.5	75 25	85 21.2	85 17
	5	50 50	65 32.5	75 25	85 21.2	85 17
RENT and HEAT	2	24 24	35 17.5	40 13.3	50 12.5	60 12
	3	24 24	40 20	45 15	60 15	70 14
	4	24 24	45 22.5	45 15	60 15	70 14
	5	24 24	45 22.5	50 16.7	70 17.5	80 16
	5	24 24	45 22.5	50 16.7	70 17.5	80 16
CLOTHING	2	12 12	18 9	24 8	32 8	40 8
	3	14 14	22 11	30 10	40 10	50 10
	4	16 16	26 13	36 12	48 12	60 12
	5	17 17	30 15	42 14	56 14	70 14
	5	17 17	30 15	42 14	56 14	70 14
HOUSE-KEEPING EXPENSES	2	5 5	20 10	25 8.3	55 13.7	65 13
	3	5 5	22 11	25 8.3	55 13.7	65 13
	4	5 5	25 12.5	30 10	60 15	75 15
	5	5 5	25 12.5	30 10	60 15	75 15
	5	5 5	25 12.5	30 10	60 15	75 15
MISC. and SAVINGS	2	29 29	87 43.5	166 55.3	213 53.3	285 57
	3	20 20	66 33	145 48.3	180 45	250 50
	4	11 11	44 22	124 41.3	157 39.3	220 44
	5	4 4	35 17.5	103 34.3	129 32.3	190 38
	5	4 4	35 17.5	103 34.3	129 32.3	190 38

This budget prepared by B. M. Andrews, Jr. (Teachers College, Columbia University) suggests the division of the monthly income at various levels for families of different sizes. Besides the expenditures for necessities (food, clothing, shelter, and operating expenses) provision must be made for advancement, such as savings, education, recreation, health, travel, and church obligations.

Recipes and menus have taken on a fascinating variety as home economics experts have used their scientific knowledge and inventiveness in this field. It has been proved that the taste and even the appearance of food, as well as its chemical content, contribute to its effect on the human body, so that the artistry of the homemaker in making meals attractive has a physical as well as an esthetic value.

Clothing is another of the home's major interests, so this science and art of the home deals with its manifold problems. School courses usually begin with plain sewing and mending, and extend into every

budget, so that all may understand the necessity of limiting some expenses to make the income cover all needs. If one member of the family or one item of expense takes more than a just share, the rest will suffer.

All home making centers around the well-being of the child. To make a science of child care, teaching it in schools, in public lectures, in books and magazine articles, was thought revolutionary not many years ago. Members of the older generation even scoffed at a scientific approach to a process as old as the world—that of rearing babies. But the approach was accepted,

because there is no subject in the world on which mothers are so eager for knowledge and help. They soon realized that the dietitian, the hygienist, the playground expert, and, most recently of all, the psychologist, with his scientific understanding of child nature, could help them in this most important of all tasks. In the schools, girls even in the elementary grades are taught something of child care, for often they are called upon to care for a small brother or sister, and this work helps, too, to prepare them for the business of parenthood.

The teaching of home nursing is a valuable branch of home economics, for modern health study has proved that some of the traditional preventives do not keep disease away as was once thought. If serious sickness does come to the family the advice of a physician should be asked, but certain danger signals should be recognized by the person who is responsible for family health. The doctor diagnoses the illness, gives prescriptions, and general orders, but the responsibility of carrying out instructions rests on the home nurse. There are important duties other than administering medicine. Taking temperature, pulse, and respiration, making the patient comfortable with bed devices, bathing, giving fresh air and sunshine, and limiting the calls of visitors are all duties in caring for the sick.

Diet is sometimes as important in the treatment of disease and its control as are medicine and surgery. Processes of elimination, digestion, and assimilation are very different in sickness from what they are under normal conditions. One must know whether the patient needs a liquid, soft, or light diet, the nature of such diets, and how to prepare them. The many simple remedies which are helpful should be kept in the home medicine chest, and the nurse should be familiar with necessary drug supplies, disinfectants, and equipment required for first aid.

Social Responsibilities Emphasized

The problem of family relationships is given weight in home economics classes in the schools. Right attitudes toward home life are developed. The qualities of coöperation and cheerfulness are stressed, in order that young people may realize that the home should be a pleasant place for all members of the family. Appreciation of the father's part in providing the

income for the family and of the mother's part in managing the home is an important aim, and the responsibility of each member of the family is discussed. The importance of such matters as courtesy to parents, help in caring for younger brothers and sisters, care of personal belongings, and fairness in spending only one's share of the family income are pointed out. Responsibility to the community and the nation as well as to the home is taught.

A Field of Wide Opportunities

While home making in itself is a profession, even if applied only to a small city apartment, many people, particularly women, make of it a vocation of wider range. There is no field today in which finer opportunities are offered the girl with a natural aptitude for home economics or any of its many branches. She may teach, of course, either sewing or cooking or any of the other included subjects. She may also lecture to groups of women or girls under various auspices. She may write on home economics subjects, do editorial work for one of the many magazines and newspaper departments devoted to this field, or she may write copy for advertising the many things the housewife buys. Many manufacturers of food products and trade associations made up of manufacturers of a certain type of product conduct research departments, demonstration schools, and services of many other kinds for homemakers. These offer interesting and lucrative positions to women.

The radio has opened up still another field in this connection, and the women who prepare and give radio talks of interest to women are usually required to have a background of home economics training. Women with special knowledge of foods may serve a hospital or a hotel as dietitian, or manage a tea room, restaurant, or community kitchen. Many positions in stores demand home economics training; and the costume designer and the interior decorator must be grounded in its principles.

Certainly the old stigma of "drudgery" cannot now be applied to the profession of home making, either in the phases of it which concern the mother of a family or in those which concern the expert in any one of its branches. It is one of the least monotonous of professions, and one which demands the highest attributes of mind, personality, and executive ability.

—REFERENCE-OUTLINE for Organized Study of HOME ECONOMICS—

THE STUDY of home economics has an important place in general education. The four main topics of which it treats are food, clothing, shelter, and home management. The article on Home Economics H-325 tells something of the scope of the subject as it is taught in the schools. In this outline are references to other articles and parts of articles which will be of assistance both to the homemaker and the student of home economics.

I. DEVELOPMENT OF THE SCIENCE OF HOME ECONOMICS: H-325-9.

A. Changing Living Conditions and New Inventions Revolutionize Home Making Methods: H-325.

- B. Beginnings of the Teaching of Home Economics: H-325.
- C. The Many Branches of Home Making Included in Home Economics Courses: H-325.
- D. Opportunities Offered by the Profession of Home Economics: H-327, V-323, V-328.
- II. FOOD: F-140.
 - A. History of Food: F-140-3, C-244-5 and picture.
 - B. Foodstuffs and Their Functions in the Body: F-144.
 - a. Proteins: P-356, B-109, B-111, D-68, F-144-5.
 - b. Carbohydrates: B-109, F-144.
 - 1. Sugar S-319, F-144, D-69, B-79; Syrups—Maple M-54; Corn G-107.
 - 2. Starch S-276, F-144, D-68, P-324.

- c. Fats: F-18, F-144-5.
 d. Minerals: M-185, F-144-5, H-372. Calcium C-19; Phosphorus P-177; Iron I-134; Iodine I-118.
 e. Vitamins: V-309, H-372.
 1. Value of Sunlight H-371; Ergosterol U-177.
 2. Deficiency Diseases from Lack of Vitamins: Beri-Beri F-143 picture, F-146, R-103, V-309-11; Pellagra F-146, V-312; Rickets C-19, V-311-12; Scurvy F-146, V-310-11.
 z. Water: W-42, M-172, D-69, H-373, F-144, F-146.
 C. Value of Roughage: F-146, H-372.
 D. The Chemistry of Foods: B-109.
 a. Important Elements in Foods: Carbon C-82; Hydrogen H-368; Oxygen O-261; Nitrogen N-147; Albumen A-111.
 b. Acids and Alkalies: A-10 picture.
 E. The Calorie, Unit of Food Measurement: C-35, F-144-5, H-262.
 F. Digestion: D-68, B-110. Enzymes E-298, B-109; Fermentation F-24; Pepsin P-120.
 G. Cooking: C-349, C-47, C-70, C-224.
 a. Bread and Cake Baking: B-228, F-141 picture. Flour F-117, W-81, R-202; Leavening Agents—Yeast Y-204; Baking Powder B-15, S-189; Cream of Tartar G-136.
 b. Soups: C-351.
 c. Meats, Eggs, and Vegetables: C-351-2.
 H. Important Foods:
 a. Grain Foods: Barley B-46; Buckwheat B-258; Corn C-366, S-276; Kafir K-1; Millet M-176; Oat O-191; Rice R-101, F-143; Rye R-202; Wheat W-81; Breakfast Cereals B-233; Hominy C-368; Macaroni M-1.
 b. Milk: M-172, P-356, F-144, C-19. Care D-4, B-12 and picture; Milk Products—Butter B-281-82 and picture; Cheese C-165, F-144a-45; Ice Cream M-173, D-4; Oleomargarine O-221, C-368, C-376, C-294.
 c. Meat: M-96. Cuts of Beef M-101 picture.
 d. Poultry and Game: Chicken P-338; Duck D-116; Goose G-119; Grouse G-179; Guinea-Fowl G-183; Pigeon P-215; Pheasant P-157; Quail Q-1; Rabbit H-221; Turkey T-158.
 —Egg E-192, F-144a-45.
 e. Fish: F-74. Comparative Value to Milk M-172 and picture; Fish Eggs (Caviar) E-192, S-310.
 f. Shellfish and Related Foods: Clam C-258; Crab C-390; Crawfish C-391; Frog F-208; Lobster L-175; Oyster O-262; Scallop S-36; Shrimp S-135; Terrapin T-167; Turtle T-167, T-168.
 g. Vegetables: F-144-46.
 1. Leaf Vegetables: Brussels Sprouts C-1; Cabbage C-1, V-311; Chard B-79; Dandelion D-9; Endive (Fact-Index); Kale C-1; Lettuce V-312; Mustard Greens C-1; Spinach F-144a, F-145; Turnip Greens C-2.
 2. Roots: Beet B-79; Carrot C-87, V-311; Horseradish C-2; Parsnip P-83; Radish C-1; Rutabaga C-2; Salsify (Fact-Index); Sweet Potato S-341, V-311; Turnip C-2; Yam S-341.
 3. Stems and Stalks: Asparagus A-336; Celery C-121, F-146; Kohlrabi C-1; Rhubarb R-100.
 4. Tubers: Artichoke A-316; Potato P-324.
 5. Seeds and Pods: Bean B-65; Lentil L-98; Okra (Fact-Index); Pea P-90; Peanut P-94; Sweet Corn C-368, C-369.
 6. Bulbs: Chive, Leek, Onion, Shallot O-225.
 7. Flowers and Fruits: Broccoli C-1; Cauliflower C-1; Cucumber C-413; Eggplant (Fact-Index); Mushroom M-306; Pumpkin P-366; Squash S-265; Tomato T-106, V-311.
 h. Fruits and Nuts: F-211, F-144b, N-187.
 i. Food Adjuncts: Spices and Condiments S-249, F-142; Relishes—Pickles C-413; Olives, O-223; Catsup and Chili Sauce T-107; Gelatin G-25.
 j. Beverages: Chocolate C-223, C-10; Cider A-232; Cocoa C-292, C-10; Coffee C-294, F-144; Grape Wine G-136; Lemonade L-93d; Limeade L-138; Loganberry L-180; Tea F-144, T-21, S-31.
 I. Preservation of Food: A-223. Refrigeration R-67, E-236 picture, F-142 and picture; Canning C-73-5; Jams and Jellies C-73; Dehydration D-38; Salting S-15; Water Glass S-190; Protection from Mold M-169.
 J. Pure Food Laws: P-368.
 K. National Dishes: F-143-4.
 L. Serving of Food: Table Equipment—Chinaware P-327, P-334; Glassware G-101, A-173-4 and picture; Linens L-148, F-105; Silverware S-106, K-33, E-312, N-143, A-133; Table Etiquette E-311, E-312-312d.
 III. CLOTHING: C-273, D-106.
 A. History of Costume: Egypt and Babylonia D-106 and picture, C-276; Greek and Roman D-106, D-107 and picture, C-276; Medieval D-107 and picture, C-276; European 15th-17th Centuries D-107, D-108 picture, D-109; 18th and 19th Centuries D-109; American Colonial A-172, H-236, P-264, P-265 picture; Modern D-110-13 and pictures; the History of Textiles and Embroideries T-61; the History of Lace L-47.
 B. Fibers the Source of Textiles: F-30.
 a. Vegetable: Cotton C-375, T-61, T-65, C-274; Linen L-148, F-105, C-274; Rayon R-53, C-274, S-150.
 b. Animal: Silk S-144, C-274; Wool W-140, S-104, C-274.
 c. Mineral: Asbestos A-323; Glass T-69.
 C. Spinning, Weaving, and Knitting: S-258, K-31, T-61-3. Kinds of Cloth T-69.
 D. Bleaching and Dyeing: B-155, D-121, C-274.
 E. Adulteration of Materials: S-87. Silk S-150; Wool W-140; Linen L-148.
 F. The Clothing Industry: C-277. The Effect of Fashion on Manufacture C-276.
 G. Selection: Suitability D-110-13 and pictures; Choice of Fabrics D-111-12, S-87; Selection of Accessories D-113.
 H. Sewing: S-87.
 a. Designing: D-110-113.
 b. Equipment: Needles N-61; Thread T-85; Pins P-219; Buttons B-286; Sewing Machine S-92.
 c. Hints and Cautions in Sewing: S-92.
 I. Hats and Caps: H-235.
 J. Shoes and Gloves: S-130; G-106.
 K. Leather and Furs: L-83, F-223.
 L. Care of Clothing: Patching and Mending S-90-1 and pictures; Laundering and Dry-Cleaning L-71, S-150, R-55, S-15.
 IV. SHELTER—THE HOUSE AND ITS EQUIPMENT:
 A. The History of Shelter: S-110, A-270.
 B. House Planning: B-265-8 and picture. (See also Reference-Outline for Architecture.)
 a. Choosing the Site: B-265.
 b. Selecting Materials: Cement and Concrete C-124, C-328; Brick and Tile B-236; Plaster and Stucco G-190, B-265; Lumber L-218, B-267; Roofing (asphalt, slate, etc.) B-266, A-337, S-158, A-131; Fire-proof materials B-266.
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 a. Floor Finish and Coverings:
 1. Varnish V-273; Wax W-58.
 2. Rugs and Carpets R-171; Linoleum and Oilcloth L-149, B-266.
 b. Wall Coverings: Wall Paper W-3; Burlap J-232; Tapestry T-9-10, T-11 picture, T-65; Tile B-239, B-266-7 and picture; Paints and Varnishes P-32.
 c. Hangings: Curtains and Draperies I-104-7 pictures.
 d. Lighting: L-56, I-107, B-266-8. Systems—Electricity E-233; Gas G-22; Acetylene A-7.
 e. Furniture: F-219, I-98-107. American Colonial A-168-71.

- f. Decorative Objects: Mirrors M-199; Baskets B-57-9; Pottery P-327; American Colonial A-172-5.
- g. Color Harmony: C-308d.
- D. Heating: H-374, B-263-6.
 - a. Furnaces: F-218, H-264, H-374.
 - b. Stoves: S-304, G-23.
 - c. Fireplaces: S-304, B-239, A-171, A-172 picture, A-164 picture.
 - d. Air-Conditioning H-266.
- E. Household Equipment: Electric Labor-Saving Devices E-236 pictures, E-237, V-268; Brooms and Brushes B-250; Weights and Measures W-67; Kitchen Utensils—Aluminum A-138; Copper C-357; Earthenware P-327; Enamelware E-263; Glassware G-101, B-192; Pewterware A-132, A-173-4 and pictures; Linens L-148, F-105; Tableware—Silver S-106, K-33, E-312a, N-143, A-133; Chinaware P-327, P-332-4.
- F. Fire Prevention: B-265, B-268, F-56.
- V. HOUSEHOLD MANAGEMENT: H-326.
 - A. Sanitation: H-372, 373-4.
 - a. Water: W-42. Source W-53; Purifying W-55, C-223; Plumbing P-260.
 - b. Dust—Its Dangers: H-374.
 - c. Household Pests: Ant A-211; Bedbug P-68; Cockroach C-291; Flea F-106; Fly F-123; Mosquito M-266, G-78; Moth B-286; Mouse M-293; Rat R-51.
 - d. Micro-Organisms: Mildews and Molds M-169; Bacteria B-12, G-77.
 - e. Disposal of Waste: S-87, H-256.
 - f. Cleaning Materials:
 - 1. Absorbents: Talc T-6; Fuller's Earth F-217.
 - 2. Solvents: Alcohol A-112; Ammonia A-188; Benzene B-97; Ether E-306; Gasoline and Naphtha P-150; Glycerin G-108; Soap S-175-9, F-19.
 - 3. Bleaches: Chloride of Lime B-155; Sulphur Dioxide S-324; Hydrogen Peroxide B-155.
 - g. Disinfectants: A-223, C-289.
 - h. Use of the Refrigerator: R-70.
 - B. Ventilation: H-263. Need of Pure Air H-374; Humidity H-264.
 - C. First Aid and Home Nursing: F-63-66, H-327.
 - D. Safety in the Home: S-2.
 - a. Fire Hazards: F-56.
 - b. Poisons and Antidotes: P-274-5; F-64.
 - E. Budget: H-326.
- VI. FAMILY LIFE:
 - A. History of Marriage: M-68.
 - B. History of the Family as a Social Unit: F-8.
 - C. Family Relationships: H-327.
 - a. Baby and Child Care: B-1, C-199.
 - b. Problems of Adolescence: A-21.
 - c. Character and Personality Development: C-140.
 - 1. Emotions and Habits E-262, H-193.
 - 2. Good Manners in the Home E-311.
 - 3. The Art of Conversation C-347a.

HOMER. There is no greater name in poetry than that which stands for the unknown author or authors of the famous epics of Greece, the 'Iliad' and the 'Odyssey'. According to the ancient historian Herodotus, Homer was an Asiatic Greek who lived about 850 B.C. But the Greek historians themselves differ as to when he lived and where he was born.

Seven cities contend for Homer dead
Through which the living Homer begged his bread.

Tradition pictures him as a blind old man, who wandered from place to place reciting his poems. Many scholars, however, hold that these great epics were

VII. USE OF LEISURE IN THE HOME:

- A. Reading for Pleasure: R-58b.
 - a. The Child's Own Library: L-107.
 - b. Magazines and Newspapers: M-25, N-108.
- B. Hobbies: H-313. Home Photography P-179; Stamp Collecting S-267.
- C. Pets and Their Care: P-153. How to Choose and Train Your Dog D-84; How to Stock and Keep a Home Aquarium A-234.
- D. Home Gardening: G-6, N-41.
- E. Play and Games: P-247.
 - a. Play Materials for Children: P-258.
 - b. Common Household Games: Charades C-143; Playing Cards C-83; Checkers C-163; Chess C-182; Billiards B-108.
- F. Puppets: P-368a.
- G. Magic: M-32a.
- H. Vacation Activities: V-266a.

Note: For additional subject-matter, references, and suggestions, consult the following Reference-Outlines:

ARCHITECTURE: A-274
CHARACTER EDUCATION: C-142
PHYSIOLOGY AND HYGIENE: P-207
PSYCHOLOGY: P-363
SOCIOLOGY: S-185
VOCATIONAL GUIDANCE: V-329

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not composed by a single person, and were not written until centuries after they took the form in which we know them. It is almost certain that they were long handed down from memory, as there is little evidence that writing was practised in Greece at so early a period. One theory of their authorship is that they are the work or compilation of a company of poets or minstrels, who composed, collected, and handed down in this form the legends of the Trojan War. The 'Iliad' and the 'Odyssey' are sometimes attributed to different writers, and sometimes to early and later periods of Homer's genius.

But the question of the authorship of the 'Iliad' and the 'Odyssey' is of little importance beside the poems themselves, which are the greatest epics of any age or country. Later poets, both ancient and modern, and in all lands have paid homage to the master, whom Tennyson called "the Ionian father of the rest."

The Greek war about Troy forms the basis of the poems. The 'Iliad' tells the story of "the wrath of Achilles," while the 'Odyssey' relates the many adventures of Odysseus (Ulysses) on his voyage home. Even though the poems contain only a shadow of historical fact, scholars owe a great debt to them for the information they furnish concerning early life in the lands about the Aegean Sea. Excavations by Schliemann and others on the site of Troy and elsewhere have abundantly confirmed the information from the poems (*see* Aegean Civilization; Schliemann, Heinrich).

One does not need to be a scholar to appreciate the wonderful stories in Homer, for they appeal to all, young and old alike. The boy or girl who reads the poems in translation or paraphrase cannot miss the charm of the story, or fail to be interested in the heroic characters, as he follows them through the stirring battle scenes of the 'Iliad' and through the many and strange adventures of the 'Odyssey'. Only the student of the Greek language, however, can fully appreciate the simple and lofty beauty of the style of the original, the directness and vigor of the "winged words," and the flowing music of the long, hexameter lines.

The best prose translations of Homer are those of the 'Iliad' by Lang, Leaf, and Myers; and the 'Odyssey' by Butcher and Lang. One of the best-known translations in verse is that of Pope, but his version conveys less of the spirit of Homer. The American poet William Cullen Bryant made a poetic translation of great merit. Some of the best-known Homeric tales may be found in this encyclopedia. (*See* Achilles; Ajax; Amazons; Circe; Cyclops; Hector; Odysseus; Paris; Proteus; Trojan War.)

HONDURAS. The history of Honduras goes back to the days of Christopher Columbus, whose first landing on the continent was at Cape Honduras in 1502; but this Central American republic is still one of the least-developed regions in the New World. In spite of its great mineral wealth, fertile soil, great forests, and other natural resources, few vessels visit its low, swampy, fever-stricken Caribbean shore except the banana boats that ply to New Orleans and New York, or tramp steamers seeking cargoes of logwood, mahogany, or hides. The chief center of settlement is on the Pacific Ocean side.

A coasting steamer brings you from San Francisco or Los Angeles to the Gulf of Fonseca, one of the finest natural harbors in the world, and comes to

anchor off Amapala, on Tigre Island, the Pacific gateway to the republic. From Amapala a motor boat will carry you to the mainland. There you start by automobile up the 85-mile highway to Tegucigalpa, the capital, healthfully situated 3,200 feet above sea level. This city, with 43,000 population, is the only capital in Central America without a railroad. You can, however, reach it by airplane, from either Pacific or Atlantic seaports, for air service is well developed.

A long motor journey over mountainous roads northward from Tegucigalpa brings you to San Pedro Sula, the head of Honduras' chief railroad. Originally intended to extend from coast to coast, it runs only some 60 miles inland from the Caribbean port Puerto Cortez. Other short lines connect the Caribbean ports with the banana plantations.

In the interior the climate is healthful and the high plateaus are dotted with

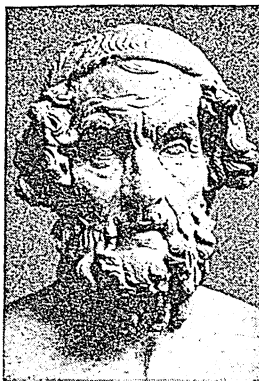
cattle and hog ranches. In the warm valleys coffee and tobacco are raised for export. But the chief money crop is bananas, of which Honduras is the world's largest producer. The republic's welfare depends on conditions in this industry. Corn, beans, rice, potatoes, sugar cane, henequen, and indigo are raised for local use. Some silver and gold are exported, but other minerals, though abundant, are little mined. The United States is Honduras' chief customer.

The country has many economic problems to solve, especially in relation to the banana industry. This industry, already hard hit by the world depression, has been threatened recently by the appearance of a plant disease which may make it necessary to replace bananas with other crops.

The population (about 1,000,000) is largely of Spanish and Indian descent, with a mixture of Negro blood on the north coast. In some of the less-explored regions dwell Indian tribes, little touched by civilization. The area (46,250 square miles) is just a little larger than that of Pennsylvania. Most of the surface is mountainous, with heights ranging from 5,000 to 10,000 feet. (*See also* Central America; Yucatan.)

The first European settlement was established by Hernando Cortez in 1524. For three centuries this region shared the fate of the other Spanish provinces in America. Since independence was gained, revolutions and civil wars have been frequent. The United States has several times intervened and sent armed forces to restore order.

British Honduras (formerly called Belize) is a British crown colony. It was founded early in the 17th century at the lower end of the Yucatan peninsula by poachers on the Spanish logwood forests. Conflicts with Spain lasted until 1798, and it was only after the revolt of Central America from Spanish rule that Great Britain's rights were clearly recognized. The area is 8,598 square miles, the population about 56,000. Mahogany and chicle are the chief exports. In September 1931, about 1,000 persons were killed when the capital, Belize, was struck by a hurricane and tidal wave.



HOMER
The Father of Poetry

LITTLE TALKS
ON GREAT THINGS
by Arthur Mee

HONESTY

WE owe it to ourselves, to our neighbors, and to the world, to be honest. We must live with one another; the lives of others cross our own a hundred times a day, and there is no enduring happiness unless we treat one another fairly.

It is true, as the copybooks tell us at school, that honesty is the best policy. It will bring us hardships at times, but it will give us peace in the end. There are rogues and thieves who make fortunes; there are dishonest men who make a great noise and build up great wealth and seem to enjoy great happiness; but they live in no security; they are held in no esteem, and at any time the day after tomorrow may bring them clattering down.

It goes without saying that we must tell the truth—nothing but misery can come from falsehood. If men cannot believe us, they will have no dealings with us, or else they will deal with us as men who cannot be relied on. We depend on one another in all our daily lives. We depend on the truth of the timetable when we catch a train; we depend on the truth of a letter or a telegram; we depend on the word of our doctor or our druggist or our lawyer; we depend on a book that we consult for facts; we rely on a friend who tells us something he has seen. If we are not to believe all these, our lives are not worth living, for our time would be wasted, our facts would all be wrong; a false statement by a lawyer might bring us utter ruin, and a falsehood in a druggist's shop might bring us death.

We live and prosper by seeking and speaking the truth, and there is no other way to happiness. He who does not speak the truth will believe nobody else, and his life is one long round of uncertainty, haunted by the fear of being found out. Even though we suffer for it we must speak the truth. One lie leads on to another. A lie is like a snowball—it grows as it goes on its way. It leads a man from the shallows into the pit, from the marshes into the deep morass, and he is overwhelmed with shame and misery to find the sort of place to which a single lie often will bring him.

And of course we must pay our debts. We must not belong to that mean corner of the world which lives very well without much

work, and flatters little tradesmen with its patronage, but forgets to pay its bills. Nor must we keep a tradesman waiting; he has his bills to pay as we have ours; and though the little bills we owe him may be small, the bills that he owes may be very big, and many an honest man has been ruined in this world by customers who would not pay their bills.

The honest man will seek no private ends in any public cause; he will be as honest to his country as to his neighbors and his friends. He will not put his trade, or his profit, or his personal advantage, before his country's interest. All through the politics and public life of every land runs the trail of dishonesty like that. There are men who care nothing for their country, but seek to win positions of power that they may serve some purpose of their own, and the good of the people and the welfare of the State are as nothing to them. Of all forms of dishonesty none is worse than this, for it corrupts a public cause, and thousands of people, or a whole nation, may suffer for one man's gain.

Nor will the honest man seek to protect himself unfairly from responsibility for what he says. It is right that a man should be responsible for his words, for words may be like poisoned arrows, and bring death or ruin in their train. What we have to say of a man let us say before his face as readily as behind his back. It is a wise rule and a safe one.

We should remember, when we speak, the spirit of those lines by Longfellow which show us how an arrow, or a song, or a word, may have an end we do not dream of:

I shot an arrow into the air,
It fell to earth, I knew not where . . .
I breathed a song into the air,
It fell to earth, I knew not where . . .
Long, long afterward, in an oak
I found the arrow, still unbroke;
And the song, from beginning to end,
I found again in the heart of a friend.

Let us be honest to all, to ourselves and to our country. Let us think ill of none without cause. Let us scorn to say the thing that is not true, scorn to take a mean advantage of another, scorn to repeat or even listen to the gossip of dullards and fools. So we bear ourselves worthily and need not to be ashamed, for "an honest man is the noblest work of God."

HONEYSUCKLE. The fragrant flowers and colorful berries of this favorite ornamental shrub and vine are attractive to bees and birds. Many of the honeysuckles are climbers. Some are tall, hardy bushes;

FRAGRANT VINE



Japanese honeysuckle (*Lonicera japonica*) is a climbing vine with white or purplish blossoms and black fruit. It is native to East Asia, with several cultivated varieties of which Hall's honeysuckle is a favorite.

others are trailers. The trailers form good ground cover, but the wild species are such sturdy growers that they may become pests.

The trumpet honeysuckle is a popular climber. It has orange-scarlet flowers with yellow centers, and red fruit. Hall's honeysuckle, with white or purplish flowers and orange-red fruit, makes a beautiful cover for fences. The tartarian honeysuckle, the most common bush species, reaches a height of ten feet. In May and June it is covered with

rose-pink blossoms, and in the fall with bright-red berries. Morrow's honeysuckle and the fragrant honeysuckle, both with white flowers, are somewhat smaller bushes. Among the many wild species which bloom in early summer are the fly and the smooth-leaf honeysuckles.

About 175 species of honeysuckle are found throughout the northern hemisphere. Nearly 100 species and many varieties and hybrids are cultivated. The honeysuckle family (*Caprifoliaceae*) includes the true honeysuckles (*Lonicera*), the bush honeysuckles (*Diervilla*), as well as elders, viburnums, and weigelas. Scientific name of trumpet honeysuckle, *Lonicera sempervirens*; tartarian honeysuckle, *L. tatarica*; fly honeysuckle, *L. canadensis*; smooth-leaf honeysuckle, *L. dioica*; Hall's honeysuckle, *L. halliana*; Morrow's honeysuckle, *L. morrowii*; fragrant honeysuckle, *L. fragrantissima*.

HONG KONG. When England in 1841 obtained the mountainous little island of Hong Kong from China, it was a barren haunt of pirates. But its situation had immense commercial and military value. Lying at the mouth of the Chukiang or Pearl River, 75 miles from Canton, it became the chief port of southern China and a main outpost of British defense in the Far East. In its superb sheltered harbor of ten square miles, liners and freighters from every corner of the world anchored beside junks, sampans, proas, and other strange craft of the Orient.

The city which became the center of this thriving commerce is Victoria, on the north-west corner of the island. Built by the British, it is the most European city of the Orient. It is built on terraces up the steep slope of Victoria Peak (1,825 feet). At the foot along the water front is the business dis-

trict, with massive buildings that remind one of London. Here too is the huge crowded Chinese quarter, noisy with sidewalk peddlers and beggars. Stairlike streets lead up the rocky slope. On the upper levels of the mountain, reached by cable cars, motors, rickshaws, and sedan chairs, is the residence section.

On the mainland of China, less than a mile away across the channel leading to the harbor, is the city of Kowloon, where the largest liners dock (for picture see Harbors and Docks). Ferries connect the sister cities. A government railway links Kowloon with Canton and other cities of China. There is air service to all parts of the world.

The Colony of Hong Kong includes several small islands as well as the main island and the Kowloon Peninsula. It is supported chiefly by foreign trade. The principal businesses are banking, brokerage, insurance, and similar activities arising from its trade. In addition to building and repairing ships, it prepares sugar and tea, and has small manufactures of such articles as cement, paper, glass, furniture, textiles, and tobacco, chiefly from imported materials. Aside from its fisheries, it is almost wholly dependent on imported foodstuffs. There is a university, with schools of arts, engineering, and medicine.

Hong Kong Island is about 11 miles long and from 2 to 5 miles wide, with an area of 32 square miles.

IN HONG KONG'S CHINESE QUARTER



Rickshaws and sedan chairs are the only vehicles that can travel the steep narrow streets of the Chinese quarter. The street shown here is wide and modern compared with the narrow lanes that make up most of this section.

It was ceded to Great Britain after its capture during the Opium War with China (1839-42). In 1860 China ceded the Kowloon Peninsula, and in 1898 leased an adjacent area, the "New Territories," to England for 99 years. The entire colony had an area of about 390 square miles and a population of about 1,000,000, of which 98 per cent were Chinese.

The colony was taken by the Japanese in December 1941. The outnumbered defenders of the island surrendered after 17 days of siege, when the water supply system had been destroyed or captured.

HOOKWORM. The "lazy disease" common in the warm regions of the world, including the rural districts of southern United States, is caused by the para-

sitic hookworm. It lives in large numbers in the intestinal tract, where it saps its host's vitality, stunts growth, retards mental development, and may even cause death. The larvae develop in soil polluted by the intestinal waste of hookworm victims. They usually enter the body through the skin of the bare feet, passing in the bloodstream to the heart and lungs, and eventually to the intestines. The parasites are readily destroyed by certain drugs, and the wearing of shoes will prevent further infection. Eradication of the hookworm, however, requires the cooperation of entire communities in sanitation and personal hygiene. Hookworms belong to the genera *Necator* and *Ankylostoma*, of the class *Nematoda*, or round worms.

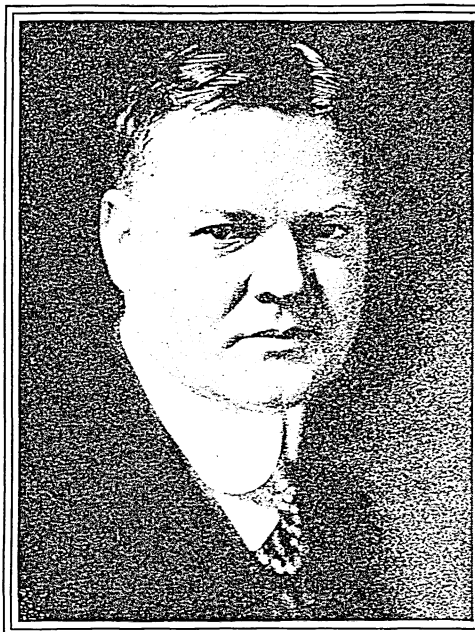
The 30th PRESIDENT of the UNITED STATES

HOOVER, HERBERT CLARK (born 1874). Probably no man in public life during the first World War and the years immediately after it has been the subject of more legend and story than Herbert Hoover. The name of this reticent Quaker was known to few outside his own profession in 1914, but four years later it was famous the world over.

The influence of heredity and his boyhood environment are strongly marked in Hoover's character. The Hoover family for at least six generations were Quakers, of Swiss origin, tradition says. The first American Hoover was Andrew, who owned a farm in Maryland about 1740. The Hoover family followed the American frontier westward until finally they reached Iowa and with other Quakers founded the town of West Branch. Here Jesse Hoover, Herbert's father, abandoned farming and became the village blacksmith. Herbert, one of three children, was born at West Branch on Aug. 10, 1874.

The summer after his father's death, when he was six years old, Herbert visited his Uncle Laban, who was government agent for the Osage nation in the Indian Territory. He learned from the Indians a woodcraft that any Boy Scout might envy. Years later he would relax from the strain of official life by going into the woods for a day's camping, building his fire Indian fashion, and doing his own cooking.

Herbert's mother, Huldah Hoover, an intelligent, efficient woman, better educated than most women in her community, died when he was nine. He lived with an uncle, Allan Hoover, on a farm in Cedar County,



HERBERT HOOVER

Iowa, for two years and then was sent to Newberg, Ore., where his mother's brother, Dr. John Minthorn, had founded a Quaker community and opened an academy. When Herbert was 14 and ready for high school, his uncle moved to Salem, Ore., and took the boy with him to act as bookkeeper and office boy.

Inspired by a conversation with an engineer about mining and about the new Leland Stanford, Jr., University, Hoover determined to become a mining engineer and entered the university in 1891. In college he did well in mathematics and the sciences. To pay his expenses he at various times delivered newspapers, served a laundry route, did clerical work and was secre-

tary to Prof. John C. Branner, head of the department of geology. Each summer he did surveying. Out of his hard-won leisure he gave considerable time to student activities. The present student constitution was largely his work, and he himself was the first treasurer of the student body.

Career as an Engineer

Leaving Stanford in 1895 with a sound theoretical training Hoover went to Nevada City to get some practical experience. His first job was pounding a drill, shoveling ore, and pushing a hand car for \$2.50 a day. Soon he had a real job as assistant to the superintendent of properties in New Mexico and Arizona, and just before he was 24 came his first great chance. Through his employer he was offered the task of introducing American mining methods into the newly opened Coolgardie gold fields in Western Australia.

Thus began a career as mining engineer which in the

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next 15 years took Hoover to the far corners of the earth. He returned from Australia in two years to marry Miss Lou Henry, whom he had known at Stanford; and left with his bride on their wedding day for China, to organize a national department of mines and railways. His explorations proved that northeastern China has the world's greatest coal deposits. During the Boxer Rebellion, which ended this work, he and Mrs. Hoover were among the 200 foreigners who were besieged in Tientsin. In 1901, while conditions were still greatly disturbed, Hoover for a few months ran a large coal mine near Tientsin for its foreign owners.

For the next 12 years Hoover spent gradually more and more time each year in the United States. As his company grew and became better known, he and his associates realized that it was a waste for him to devote his time to work as a technical expert, and he became a reorganizer of "sick companies."

Hoover's technical achievements in the period were many. In Australia, he and his brother Theodore worked out a new process of recovering zinc from the refuse dumps of the lead and silver mines. In the wild, rugged Altai Mountains of southern Siberia, he had a problem in pioneering, building roads and railroads, assembling machinery, and arranging finances before vast stores of metals, especially zinc, could be opened. In Burma he attacked a mixed deposit of base and precious metals requiring new methods both in chemistry and in engineering. Wherever he went, politics was mixed with engineering; so, when suddenly he was faced with a world-wide responsibility, he was no stranger to premiers, foreign ministers, ambassadors, and their various ways.

When the World War broke out in 1914, Hoover was in Europe procuring exhibits for the Panama-Pacific Exposition. At the request of Walter Hines Page, United States ambassador in London, he undertook to help some 200,000 American tourists, most of whom were left without funds, to return home. His organization cashed checks, made steamship reservations, and raised the funds for those who had no money. By the end of September the job was done.

Head of the Belgian Relief Commission

Then, when Hoover was about to sail for the United States, he was persuaded to undertake the task of

Belgian relief, for the German armies were using Belgium as a base against France, and the little country seemed doomed to starvation. Hoover promptly severed all his business connections, lest they interfere with the work before him. His many interests at that time promised to make him one of the world's richest men, but he turned them all over to his associates.

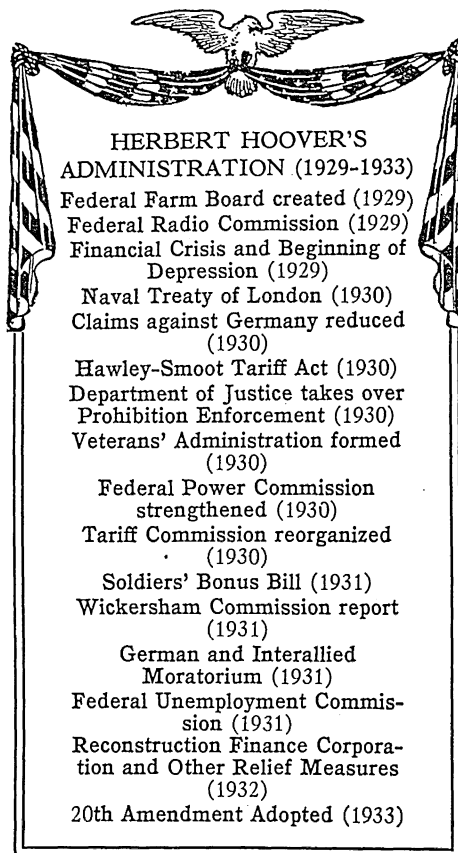
There were 10 million non-combatants in Belgium and northern France to be fed. After overcoming the objections of both the Germans and the Allies, each of whom saw an advantage for the other side in the plan, Hoover organized the Commission for Relief in Belgium. In this work he went from London to Paris, to Brussels, to Berlin, from Allied headquarters to German headquarters. He possessed information about each combatant which would have been priceless to the other. He was a trained engineer, a practised observer of such matters as terrain, roads, and excavations. Yet never once did he let slip any information which could aid one side against the other.

After the United States broke with Germany, Hoover turned the work over to the Dutch and Spanish, and the Commission's program was carried out to the end of the war. Hoover did not draw any salary and he, like many other workers, paid all of his own expenses.

United States Food Administrator

When the United States went into the conflict, Hoover was made food administrator. The law creating the Food Administration was drafted with his help, and he took charge in 1917. It was his task to see that the country produced and saved enough food to supply her allies in the war. Answering his appeal, about 14 million families pledged themselves to follow the Hoover programs. His name was a household word; to "hooverize" meant to save, to substitute, to practise denial and help win the war.

When the war ended, Hoover saved the American farmer from financial ruin by persuading the Allies to buy some of his surplus food. As head of the Supreme Economic Council, established by the Peace Conference, Hoover directed the distribution of food to the starving peoples of Europe. His organization of American business men and engineers from the army reserves not only saw that food reached the starving



nations, but helped to open traffic on railroads; became fuel administrators; fought typhus epidemics; and started the wheels of commerce which had been idle.

Finally, after the peace, Congress appropriated millions to feed Europe's undernourished children, but stipulated that no money should be spent in former enemy countries. Then Hoover sent for the leaders of his own people, the Quakers, and persuaded them to assume the task of feeding the German children.

In 1921 President Harding appointed Hoover secretary of commerce. In seven busy years Hoover made his department one of the most efficient governmental organizations in the world. He established in the Bureau of Standards a new division of simplified practice which has saved American manufacturers millions of dollars a year. He had long foreseen the need of government control of radio, and he himself worked out the main principles which Congress followed in controlling radio broadcasting. For civil aviation, he worked out a program of government support with lighted air routes, landing fields, and charts, and placed the work under a new division of aviation.

Election to Presidency

Among the possible successors of President Coolidge, the name of Hoover met with most favor. He had been mentioned as a possibility in 1920, but he had then been too slightly identified with either political party to be available. He had now behind him seven years of service in a Republican cabinet and a better training in successful private life and useful public life than any new presidential nominee since Washington. He was named on the first ballot at Kansas City, with Charles Curtis for vice-president.

The Democratic Party made an issue of the scandals that had marred the presidency of Harding. They nominated Gov. Alfred Emanuel ("Al") Smith of New York, an avowed wet, a Roman Catholic, and a man so able that the Republican Party was forced to present a first-rate candidate. The Republicans promised to maintain prosperity, to assist the farmer, and to make a better attempt to enforce the dry amendment and law in general. The South, largely Protestant and dry, turned against Smith, so that he carried only six states of the lower South; he won but two elsewhere, Massachusetts and Rhode Island. Some three of every five votes cast went to Hoover, giving him the most smashing victory up to that time.

Foreign Policy

Before organizing his new administration in 1929, President-elect Hoover indicated that his would be a friendly foreign policy. Traveling on the battleship *Maryland*, he visited the Latin-American countries, continuing the good work done by President Coolidge at the Pan-American Conference in Havana in 1928. As President, in 1930, he arranged a conference on the limitation of armaments in London; he sent a delegation to a League of Nations disarmament conference in 1932; he urged American participation in the World Court. And in 1931 he persuaded the European nations to join the United States in a general morato-

rium, by which payments on their debts to each other should be deferred for a year in the hope of advancing general prosperity. But in spite of good will the world advanced little toward peace. Europe remained upset in its business and politics; while, in Asia, Japan separated Manchukuo from China in 1931 in spite of the pledges that had been recorded in the Kellogg Pact.

Economic and Political Progress

Alone among the nations, the United States rode on the crest of a wave of prosperity which had been mounting steadily since 1921. There was money to spend; and money was spent. The national debt was reduced without increasing taxes. Cities were rebuilt, with new stores and office buildings and new homes. Automobiles became more numerous, and radio sets found buyers in nearly every family. Conveniences in the home and labor-saving machinery in the factory were multiplying. The Ohio River channel was deepened, and construction was begun on the great Colorado River improvement at Boulder Dam. The capital city, Washington, was yearly increasing in magnificence. Before he left office, Hoover laid the cornerstone of a much-needed National Archives Building.

Progress was made in public affairs. The national budget system, set up during the Harding administration, improved the management of public money matters. The Veterans' Bureau and the Pension Office were reorganized and merged. As might have been expected from his previous record, the President worked continually to improve the working efficiency of the government. Besides lending his support to a study of the organization of all government offices, he appointed commissions to survey social and economic trends in the United States, to study law observance and enforcement (the Wickersham Commission), and for many other purposes. And he held conferences of business and professional leaders on matters pertaining to the public welfare, such as the White House Conference on Child Health and Protection.

Congress reapportioned its members among the states in 1929, and the 20th Amendment to the Constitution was proposed and later ratified. This eliminated the interval when "lame ducks" remained in office after their successors had been elected (*see* Congress). It advanced the date for the meeting of a new Congress to January 3 following the election, and the date for the inauguration of the president to January 20. Still another amendment, the 21st, to repeal the 18th (dry) Amendment, was sent out to the states as Hoover left office. The willingness to try to enforce prohibition, which had prevailed in 1928, had given way to a desire to get rid of it.

Difficulties of the Farmers

But the general prosperity, spectacular and intoxicating as it was, was not sound. The farmer citizens, let down from the crest of high prices for their produce and high land values prevailing during the World War, lagged behind the rest of the country. With improved machinery the farmer could raise more food with fewer hands each year. But he could not sell it at a profit.

Europe was too poor to pay for American food unless Americans lent the money with which to buy it; and the American market could not absorb the total production at normal prices. Prices kept falling. Farmers could not pay off their debts, and banks and insurance companies that had lent money on farm mortgages could not collect what was due them. After the war the farm interests organized to press their demand for relief. New political parties were started; but more generally the farmers demanded, through the existing parties, that the government pass laws to keep the surplus food and cotton, unsalable abroad, from being dumped back into the home market to break the price. Congress was not able to agree upon the terms of such laws; nor were the farmers themselves in agreement upon the sort of law they wanted. But they asserted that Congress had long protected the manufacturer by a tariff on imports, and asked equal consideration for their own interest and safety. And it was certain that unless safety could be brought back to the farm, the welfare of the whole country would be in danger.

In the campaign of 1928 Hoover had promised that immediately after his election he would call upon Congress to pass a farm act, and to revise the tariff schedules so as to protect the farmer. In June 1929 an Agricultural Marketing Act received his signature. He did not believe that commodity prices, which depend on the balance between supply and demand, can be fixed by law, but approved the creation of a Federal Farm Board to help move the crop and to try to keep the surplus off the market. Congress allowed \$500,000,000 for this effort. But in spite of all the Farm Board could do, the price of farm products kept on falling. The farmer was left dissatisfied; and before the year was out, calamity struck the whole United States.

Conditions Leading to the Depression

Little is really known about the cause or cure of panics. At rather regular intervals for more than a century the United States has suffered from a collapse of business, followed by unemployment and spread of poverty. In every case, several years of deep depression and stagnation followed a crisis. And in every case the people climbed slowly back into prosperity without quite knowing why. Every collapse was preceded by years of extravagant earnings, during which, after provision was made for food, clothing, and housing, there was plenty of money left for enjoyment or for waste or for permanent investment. Civilization keeps going on the capital that is saved from day to day, to be used for future benefit. If this surplus of wealth is consumed in extravagance, wasted in war, fire, or calamity, or even invested unwisely, the margin that separates comfort from poverty is narrowed. The United States in 1921-29 produced heavily, piling up a huge annual surplus above the costs of immediate maintenance. But personal extravagance wasted much of this. The cost of the war had to be met from it. It financed Europe in the war and after, and Europe could not repay. Much of it was sunk in unwise investments. And when Europe stopped buying, income dropped; and

the revenues out of which both maintenance and the surplus must be cared for, fell away.

At the same time, the nation ignored danger from the constant replacement of man by machinery. Every new labor-saving device lessened the demand for labor. If there had been no other cause for unemployment, the lack of jobs following "technological change" would alone have created a huge burden upon American society. The cutting off of most of the immigration from Europe by laws in 1921 and 1924 reduced the number of workers, but there were still more workers than jobs. Wage-earners crowded from their positions must be reeducated and cared for until they get new jobs; and children growing up must find work or become a menace to themselves and to society.

But through the years of "Coolidge prosperity," which was expected to continue through the Hoover administration, little regard was paid to the threats against the future. There was a minor panic in 1921, causing Hoover, then secretary of commerce, to warn business that "if the future is like the past, such periods will recur." But few people realized that the United States was heading into another of the troughs between two booms. The financial reserves were being drawn upon more heavily than they could bear, yet business remained optimistic.

Panic broke out in October 1929. Business had been conscious during the summer of a falling-off of buyers. Automobile sales had declined, but advertising was relied on to bring the buyers back. Within a few days after the stock market had reached the highest level known, there was a complete slump.

The effect of the collapse of the boom spread rapidly to every level of society. The promotion of new business ceased. People with debts to pay could not raise the necessary amounts by selling their securities. Fear followed hope; and because of fear those who still had cash refrained from spending it. Buying stopped and dealers could not move their goods, retain their help, or pay their bills. Factories, unable to collect their debts or make new sales, laid off more hands. The unemployed lived as best they could on their savings, borrowed on their insurance, sought in vain for jobs, and felt the fear of charity. And upon the farmer, who is the ultimate producer, who was already badly enough off when the rest of the country was prosperous, fell still more burdens.

For the next three years American life went from bad to worse. The bottom of the trough had not been reached when the Hoover administration approached its end in the summer of 1932. It was now known that, in addition to the necessary consequences of depression, business was suffering also from the wild speculation and the misuse of other people's money of which some industrialists had been guilty during the boom.

Every administration in office during a panic is held accountable for the suffering, and Hoover was blamed for this misfortune. Burdened to devise untried means to bring about recovery, he had to face defections among his political friends and active hostility from

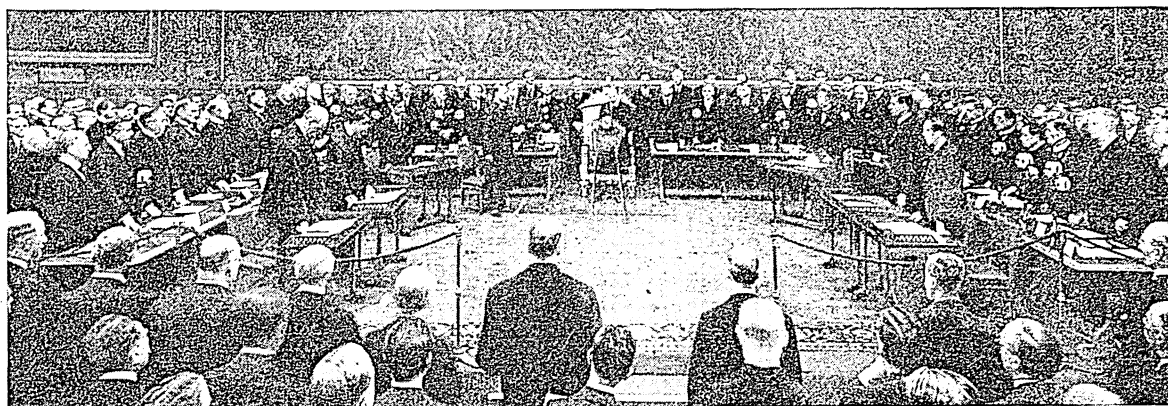
his political enemies. He was not a professional politician, and was never much liked by those who were. As a successful engineer he knew how to chart a course upon its merits. But every politician knows that government cannot do even right and obvious things unless the voters will sustain it.

A business man, Hoover was not over-popular with big business, for he believed that it ought to be governed in the public interest, and it prefers to be left alone. A somewhat diffident man, he was not completely at ease in public, and lacked the magnetic power to charm and to persuade that a president needs

and Austria were bankrupt. To retard the decline and avert possible collapse, Hoover in June persuaded Europe to assent to a one-year moratorium. But in spite of this England was forced to suspend gold payments in September, and much American gold was drawn out of banks to be hoarded by nervous owners.

Local government treasuries were nearly empty, from the drain caused by relief expenditures and from falling tax collections. Private charitable agencies were overburdened. Private savings were giving out, throwing more persons on relief. And the new Congress faced both the need for emergency laws and the

A DISARMAMENT CONFERENCE PROMOTED BY HOOVER



King George V is addressing the delegates at the opening session of the London Conference on Naval Armament (1930). The King's speech was broadcast through a world-wide network of stations. The American delegation is at the extreme left, facing right.

as he explains to the people the measures he advocates. He could not escape the depression and its consequences; and he was handicapped in two ways. No American government had ever relieved a panic, or known how to; and no one in 1929 could imagine the depths that would be reached in 1932.

Relief Measures

Hoover called the key men of business to Washington at once, urging them not to lay off hands or cut wages. He begged the states to create jobs by starting public works. He encouraged the leaders of local community chests. The states had relieved their own suffering in the past, and he believed it would be un-American for the Federal government to do it now. But when severe drouth came in 1930 he approved an appropriation and a relief commission to help the people on the burned-out farms. The Congress had no clearer view of the future than the President had. It lagged behind him, and even deserted him to pass the Hawley-Smoot Tariff. This was attacked as forgetting the farmer for the sake of the manufacturer.

Dismay at the depression turned into criticism of the Republican Party for doing so little about it. In the November elections of 1930, Democrats captured the House of Representatives for the first time in 14 years, so that during the last half of his administration Hoover had to face a divided Congress.

Before the new Congress assembled in December 1931, a world economic collapse was in sight. Germany

temptation to play politics with the approaching election of 1932 in view.

Hoover still opposed appropriations for direct federal relief, but he approved increased expenditures for public improvements. At his urging Congress created a Reconstruction Finance Corporation to lend money to banks, insurance companies, and railroads, so that they might not fail. Before the administration ended, more than two billion dollars was advanced to these companies. They were the custodians of the savings of millions of citizens. Loans to them saved some of the savings of the people, although they brought about the charge that the government was too friendly to big business. The Federal Reserve Banks were permitted to lend somewhat more generously for the same purpose. And in the summer of 1932 Home Loan Banks were established, to lend money to persons who were in danger of losing their homes through the foreclosure of mortgages.

But while Hoover urged upon Congress more relief laws than it would pass, he urged fewer than the Democrats demanded. The pressure of poverty made him enemies, and his stand on certain measures, such as the Soldiers' Bonus Bill, had already made him unpopular with various large groups. This bill, which raised the maximum loans on veterans' 20-year insurance certificates from 22½ per cent to 50 per cent of the face value, was passed over the President's veto. In 1932 the President further incurred the resent-

ment of many veterans by ordering from Washington the "bonus army" who had come there to demand immediate payment of the bonus.

Meanwhile there were more huge failures, some of them scandalous, involving banks and utility companies. In the agricultural West a Farm Holiday Association was launched to withhold food from the cities until prices rose.

Defeat in 1932

With the depression at its darkest, the presidential election got under way. Hoover and Curtis were renominated, without enthusiasm. The Democrats selected the governor of New York, Franklin Delano Roosevelt, with John N. Garner of Texas, Speaker of the House, as vice-president. Roosevelt was as successful on the platform as Hoover was diffident. He attacked the Republicans for having caused the panic and for not knowing how to ease it (see Roosevelt, Franklin D.). Hoover was crushingly defeated.

The lame duck session of Congress, 1932-33, was dismal. Signs of approaching recovery in mid-summer 1932 gave way to even worse panic. On December 15, the day for payment of European war debts to the United States, several nations refused to pay. At home frightened bank depositors tried to withdraw their money in gold. "Gold hoarding" drained large sums from the Treasury of the United States. Many banks closed, and states were forced to declare bank "holidays" to save the rest.

Aid was sought from the Federal government, but Hoover could do little. His party was split. The Democratic House preferred to put off remedial legislation until Roosevelt should be inaugurated. And Hoover, although he tried, could not find a basis on which the President-elect would cooperate with him.

No administration had begun more happily than his in 1929; none ended in such despair. Retiring to his home in Palo Alto, Calif., on the campus of Leland Stanford, Jr. University, Hoover kept his silence for two years. Then his frequent criticism of New Deal measures again brought him recognition as a force in the Republican party. He was acclaimed at the national convention in 1936, and in 1940 won scattered votes for nomination as president. But his chief rôle was that of "elder statesman" and advisor. In humanitarian work, however, Hoover again played a distinguished part. When war began in Europe in 1939, Poland and Finland made him director of the American relief effort in their behalf.

Hoover's records of the World War of 1914-1918 are an invaluable source of historical data. To house the vast collection, the Hoover Library on War, Revolution, and Peace was built at Stanford in 1940.

HOPS. When the green conelike blossom clusters of the hop vine take on a yellow tinge and rustle like paper flowers, the hop grower rushes his pickers into the field, for the value of his harvest depends on gathering this flower-fruit in the nick of time. The yellowish aromatic resinous substance called "lupulin," which is contained in the fruit, deteriorates rapidly,

and it is this substance which gives hops their medicinal and industrial value.

The hop vine is a perennial climber which each year produces several twisting stems that reach a length of 15 to 20 feet. The vines do not grow horizontally but cling to upright poles or wire. Hop vines always twist in a right-handed spiral.

There are male and female plants, but the best hops come from fields where only female plants are grown. This prevents seed production, which would detract from the value of the fruit. Plants grown from seed are not true to type; therefore hops must be propagated by root cuttings or by sets.

The principal use of hops is in making beer and other malt beverages. Bohemia is noted for the excellence of its hops. The British Isles and Germany are large producers. Most of the United States crop is grown in the Pacific coast states.

The hop belongs to the nettle family. Leaves heart-shaped, 3- to 7-lobed; flowers in panicles. Scientific name of common hop, *Humulus lupulus*.

HORN. There are two kinds of horn, one the continued growth of bone, the other a hardening of the epidermis. Corns that grow on our toes, the hard spots on a camel's knees, the tortoise's shell, the scales of snakes and lizards, birds' beaks, horses' hoofs, the horns of sheep and cattle, and the finger and toe nails of man and animals, are the latter, or true horn. It is closely related in growth and composition to hair, and is made up of about 50 per cent carbon, with hydrogen, oxygen, nitrogen, and sulphur.

The deer's horns or antlers are examples of the other kind of horn, which is really a bone outgrowth. During the growing period such horns are covered with a sensitive velvety skin, which later peels off, leaving the hard, solid antlers. These are usually shed once a year. Beneath the sheath of true horn in the case of oxen, sheep, and antelope, we find frontal bone outgrowths constituting a core. Except for those of the pronghorn antelope, such horns are never shed. Neither are those of the giraffe and the rhinoceros, which are thickened hardened masses of skin and hair, covering independent bones. Horns may be solid or hollow; in the latter case they are usually found on the female as well as on the male.

Primitive man used horn for weapons, drinking cups, and handles; then later for powder horns and musical horns. Since true horn can be softened and split into thin sheets which are tough, pliable, and easily molded, many articles both useful and ornamental have been made from it. By a dexterous mixing of dyes, common horn can be made to look like expensive tortoise shell. Formerly thin horn plates were used in window-panes and lanterns, and horn is still used in making combs, buttons, and handles for umbrellas, canes, knives, and forks.

HORN, MUSICAL. In the orchestra only the French horn is called a "horn." The trumpet, cornet, and trombone are spoken of as "trumpets." The large, powerful tubas are the tenor and bass instruments

of the brass group. The saxhorns, which are chiefly used in military bands, are keyed instruments with long winding tapering tubes, made in several sizes. They get their name from a Belgian, Adolphe Sax, who invented them. The euphonium is a small bass instrument of the saxhorn type.

Each of these instruments has its own interesting history and its own distinctive quality. The French horn gets its graceful shape from the fact that it was once a hunter's horn. Straightened out, it is from 7 to 10 feet long. Imagine a hunter riding to the chase with such an incumbrance! The tube of the horn was bent in a circle large enough for the hunter to slip over his head, and in this way he carried it to the chase.

The trumpet's brilliant and penetrating voice is due to its long narrow tube, 8 feet in length; it is only three-eighths of an inch in diameter until within 15 inches of the bell.

This tube is usually bent back upon itself to make it more convenient to handle. The circling or bending of a tube makes no difference in the tone, so long as the air space inside is undisturbed. The trumpet is very difficult to play and therefore the cornet usually takes its place.

The cornet is the smallest of the brass instruments generally employed, for its 4-foot length is bent into a short space. For all its small size, it is the most important member of most brass bands, and fills a useful place in the orchestra. Its characteristic feature is its three pistons, which vary the length of the vibrating air-column and thus enlarge its compass.

The sliding trombone is the curious instrument that the performer plays by reaching out and drawing in his arm, as he lengthens and shortens its tube to make the different tones; for, in place of keys, it is fitted with overlapping slides.

Although the tuba is the deepest voiced of all the brass instruments, it produces rich tones and its great voice can be made both soft and sweet. Its long cone-shaped tube is bent and rebent before it finally ends in the great flare that gives it such a look of weight. Like the cornet, it is played by valves.

The saxophone, an invention of the same man who invented the saxhorns, is a strange instrument of brass fitted with a mouth-piece containing a reed, like the clarinet. It is one of the important instruments of the military band, and is often employed in modern popular music because of the laughable effects that can be produced with it. (See Musical Instruments; Orchestra.)

HORNBILL. Great beaks, surmounted by bony crests or helmets, and prominent eyelashes distinguish these queer bulky birds (*Bucerotidae*) of Africa and the Malay region. Their food consists mainly of fruit and insects, but those of the larger species (about four feet long) kill and devour the largest and deadliest vipers. The horn-

bill breeds in holes in trees, plastered up with mud by the male until only a small window remains. Through this he passes food to the female and young.

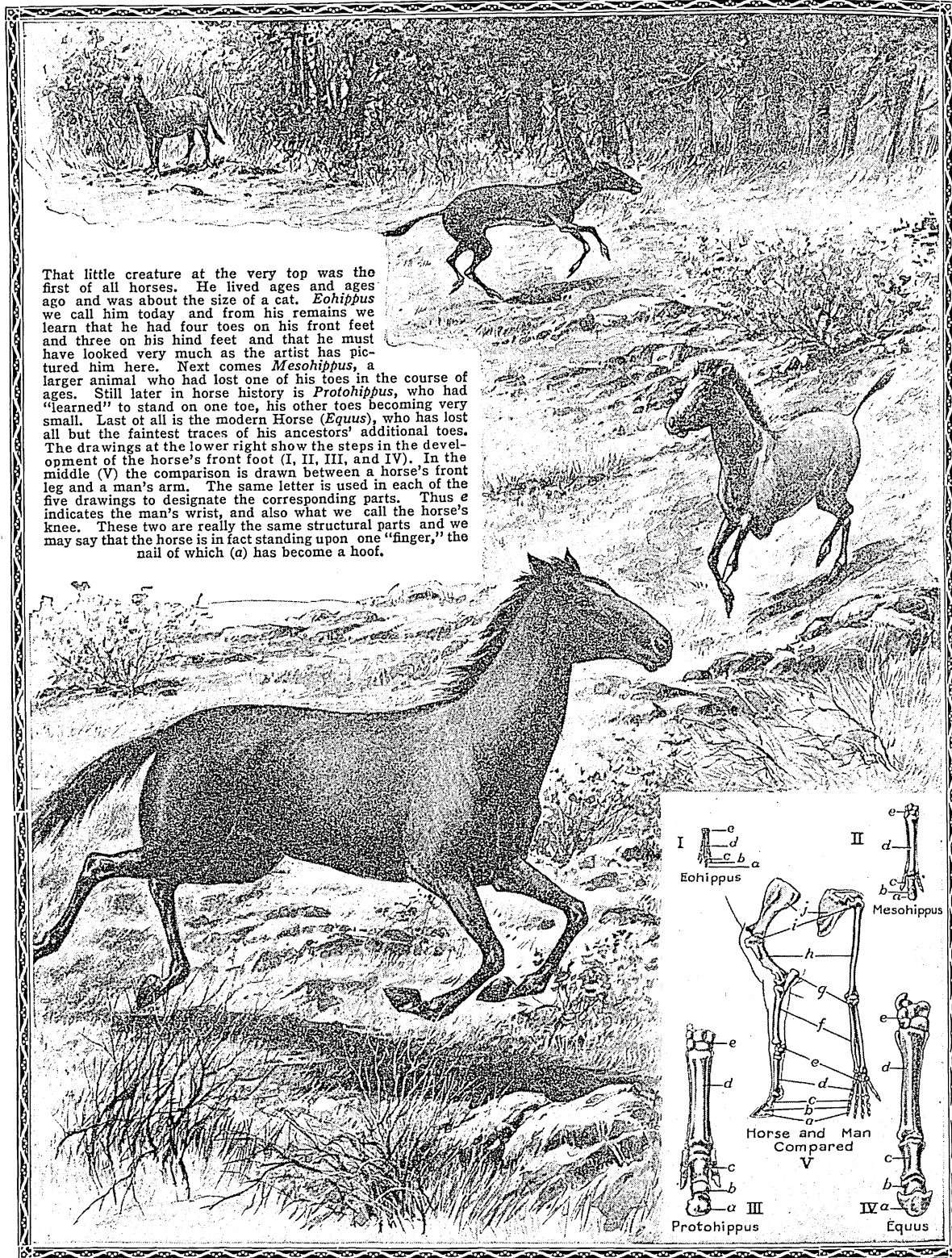
HORNET. Several large members of the wasp family are called hornets. They are social insects, building nests of paper-like pulp. Their thick bodies are usually black or dark brown, marked with brilliant white or yellow, which has earned for some of them the name "yellow-jackets." If their nests are attacked, they show a disposition so irritable and wield a sting so painful that they fully justify the common expression "as mad as a hornet." If left alone, however, they are interesting and industrious workers. They do some damage to fruit, but make up for it by the harmful insects they kill. (See Wasps.)

THE TRUMPET ECHO OF THE CENTURIES



This painting by Sir John Gilbert shows a cavalier sounding the war trumpet. To the ear of the historian that trumpet call goes echoing down the centuries to the time of the Romans; for the cavalry trumpet you see here was simply the cavalry trumpet of the Romans in another form.

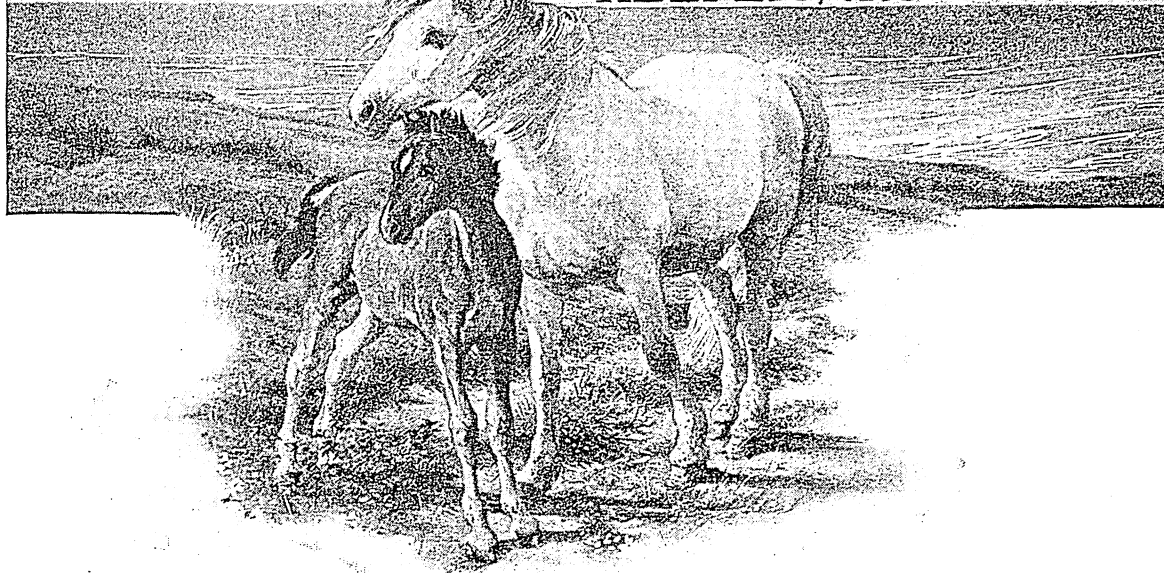
THE HORSE AND HIS GEOLOGIC ANCESTORS



That little creature at the very top was the first of all horses. He lived ages and ages ago and was about the size of a cat. *Eohippus* we call him today and from his remains we learn that he had four toes on his front feet and three on his hind feet and that he must have looked very much as the artist has pictured him here. Next comes *Mesohippus*, a larger animal who had lost one of his toes in the course of ages. Still later in horse history is *Protohippus*, who had "learned" to stand on one toe, his other toes becoming very small. Last of all is the modern Horse (*Equus*), who has lost all but the faintest traces of his ancestors' additional toes. The drawings at the lower right show the steps in the development of the horse's front foot (I, II, III, and IV). In the middle (V) the comparison is drawn between a horse's front leg and a man's arm. The same letter is used in each of the five drawings to designate the corresponding parts. Thus *e* indicates the man's wrist, and also what we call the horse's knee. These two are really the same structural parts and we may say that the horse is in fact standing upon one "finger," the nail of which (*a*) has become a hoof.

In very ancient times, all four-footed animals were "plantigrade"; that is, they walked upon the whole soles of their feet with their heels touching the ground as men and bears and elephants do today. In the course of time however there developed animals who "got up on their toes" in the manner of the horse illustrated here. Such "toe-walking" (digitigrade) animals, including creatures like deer, rabbits, mice, etc., and beasts of prey of the cat and dog tribes, became much swifter of foot and were better able to escape their enemies or overtake their prey. Thus they survived in the struggle for existence, while the "plantigrade" creatures, except those of great strength like the bear and the elephant, or of great intelligence like man, perished in the struggle for existence.

OUR SAGACIOUS COMRADE *and* HELPER, *the* HORSE



HORSE. The beautifully proportioned form of the horse and its intelligence, docility, and affection have made it man's best-loved animal friend, with the possible exception of the dog. From the earliest times of man's history we know that he used the horse, first as a source of food and later as an aid in war and a beast of burden.

The horse and other members of the horse family, the ass and the zebra, are also especially interesting because scientists have been able to trace their history more completely than that of any other animal group. So many fossil skeletons of horses have been discovered in all parts of the world that scientists have worked out a theory of its development over a vast period—some say over forty million years. They say that the remotest ancestral horse was a tiny animal about the size of a cat, with five toes on each forefoot and four on each hind foot. Fossil remains of early horses (named *Eohippus*, or "dawn horse") have been found in Wyoming and New Mexico, with four complete toes on the fore feet and three on the hind. As we follow down the series of fossil skeletons, we can see these little animals took to running on the tips of their toes to escape their enemies, and how gradually they came to throw more and more weight on the center toes. With each generation, therefore, these toes became stronger and the unused toes became weaker and finally disappeared (see *Evolution; Foot*).

That is why the horse now has only one toe on each foot. The hoof which encases it is just a greatly enlarged and thickened toe-nail. Traces of two of the lost toes may be found in the splint-bones which

grow on either side of the cannon-bone of the feet. The upper joint of the toe has also become much larger and stronger. It is known as the "fetlock." The joints that are usually called the knees of the horse correspond to the ankles and wrists of a human being. The true knees and elbows are concealed within the body of the horse but they may be seen clearly when it is in motion.

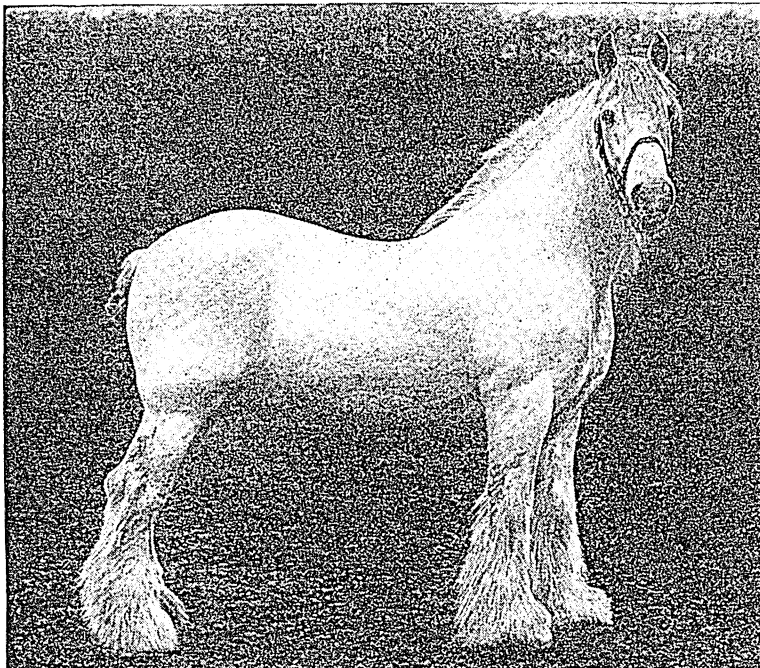
The horse has a symmetrical form, strong limbs, a long head with large lustrous eyes, small pointed ears which it can move, and wide-open dilating nostrils. The neck is long, the body rounded and fleshy; the hair is soft and short, and lies close to the body, growing into long coarse strands in the mane and tail. The mane falls in graceful waves down one or both sides of the neck and over the face. The tails of the ass and the zebra are tufted at the ends, but in the horse the long hairs grow from the base and sides as well as from the tip.

The horse eats grass and grain but does not chew the cud. It has from 36 to 40 teeth—three incisors, or cutting teeth, and six grinders on either side of both jaws. In addition to these the males have four small canines, or dog-teeth. Between the canines and the grinders there is a space where the bit is placed, an arrangement by which alone man has been able to subdue this vigorous animal.

The colt is born with its eyes open and its body fully covered with hair. It is able to stand and walk a few minutes after birth. Within two weeks the "nippers," or central teeth, make their appearance. Other teeth soon follow and when the colt is about six months old it has a full set of milk-teeth, which it

begins to shed during its third year. The dog-teeth, or canines, make their appearance, but only in the males, during the fourth year, and when the colt is five years old its set of permanent teeth is complete.

ONE OF THE FAMOUS SHIRES



The Shires, whose native home is in the heart of England, are the largest of all horses. They have a heavy covering of shaggy hair from the hoofs to above the knees.

The growth and changes in appearance of the teeth are so regular up to the tenth year that the age of the horse may be judged by them, but after the tenth year these annual changes cease. During its second year the colt's hair loses the curliness which distinguishes its first season, and becomes more lustrous. The hair, except the mane and tail, is shed annually in the spring. In the fall it grows longer and forms a warm winter coat.

From the piles of horse-bones found in the haunts of the early cave men we know that the wild horse was first pursued for food. As a tamed servant of mankind the horse was unknown to Egypt of the Pyramid Age (3000-2500 B.C.), and to the Babylonians before 2100 B.C. The first to tame the horse were Aryan (Indo-European) peoples who inhabited the vast grass-lands that stretched north of the Caspian and Black seas.

All the early monuments and records indicate that for many centuries the horse was used chiefly to draw chariots in war, and was not ridden. As beasts of burden the ox and the ass were used long before the horse.

Several species resembling the horse and the ass are still found wild in central Asia, such as the "kiang" and "onager." Zebras and wild asses are also found in Africa, in the deserts of Syria and Persia, and in the central plains of India. (See Ass.) When white men first came to America the horse was entirely unknown to the natives and increased their awe of the newcomers. The wild horses later met with in South America and the mustangs or Indian ponies, which until quite recently ranged wild over a great part of western North America, are descendants of tamed horses that escaped from the Spaniards in the 16th century. Likewise, the wild horses of Australia are descended from stock imported from Europe.

By careful breeding and crossing of the different stocks, a great many varieties of horses have been produced, ranging in size from the London cart horse, which attains six feet, sometimes seven feet, at the withers, or highest point of the shoulder, to the Shetland pony, which sometimes is less than three feet in height. There are three main types of horses: the heavy draft horses; the tough, shaggy varieties; and the slender rapid travelers.

Most of the ordinary horses of northwestern Europe are descended from the ancient dun-colored Norse horse. The ancestors of our modern draft horses were

THE TINY HORSES FROM THE FAR NORTH



We'd be very glad to wear our hair long like that if we were Shetland Ponies and lived up on those cold islands off the northeastern coast of Scotland. In warmer climates Shetland ponies do not grow such thick shaggy coats.

first bred as war horses, because a very large and powerful animal was needed to carry the huge weight of a mail-clad knight. Varieties from France, Bel-

A FAMOUS RACE HORSE



This is the famous race horse "Man o' War." Notice his fine, clean, lean head and his long muscular neck.

of long hair, or "feather," extending around the front of the short stout legs. The magnificent Clydesdale, a Scottish breed named from the valley of the Clyde, is noted for its sprightly action, as well as for its strength and endurance. Not quite so large as the Shire, and with less feather on the legs, it is faster and more mettlesome. The Percheron, which originated in the old French district of La Perche, is the most popular draft horse in America. It is usually some shade of gray, and combines intelligence with strength, beauty, and endurance. The Belgian, developed from the old Flemish horse, shares with the Shire the distinction of being the heaviest of the draft breeds, often reaching a weight of 2,400 pounds or more. It has a very wide deep body with powerful muscles, and is somewhat sluggish.

Turning to the light, active type of horse, we have Arabs, Thoroughbreds, Standard Breds, Morgans, and Saddle Horses. These never exceed 1,200 pounds in weight. The Arab has furnished the foundation for nearly all modern breeds of light horses. It is a small, gracefully proportioned animal, from 14 to 15 hands in height (a hand is four inches), and possesses intelligence, courage, docility, and endurance to a superlative degree. For combined speed, stamina, and weight-carrying ability, it is excelled by none. The Arab was a favorite military steed. George Washington rode an Arabian charger through his vigorous campaigns, and the mounted skin of Napoleon's famous white Arab, "Marengo," is still preserved in a Paris museum.

The Arabian tribesman loves and fondles his horse as he does his child. The owner of a brood mare carefully selects for her mate a stallion of unblemished descent, and often keeps the mare and colt in his own tent. The original home of the Arabian horse was not the country for which it was named. The Arabs were without horses until after the Christian era. The Egyptians,

and Germany were long ago imported into Great Britain, where some of the most famous modern breeds originated. The principal draft breeds are the Shire, Clydesdale, Percheron, and Belgian.

The Shire, which has been bred for centuries, is of immense weight—from 1,800 to 2,400 pounds—with a plentiful covering

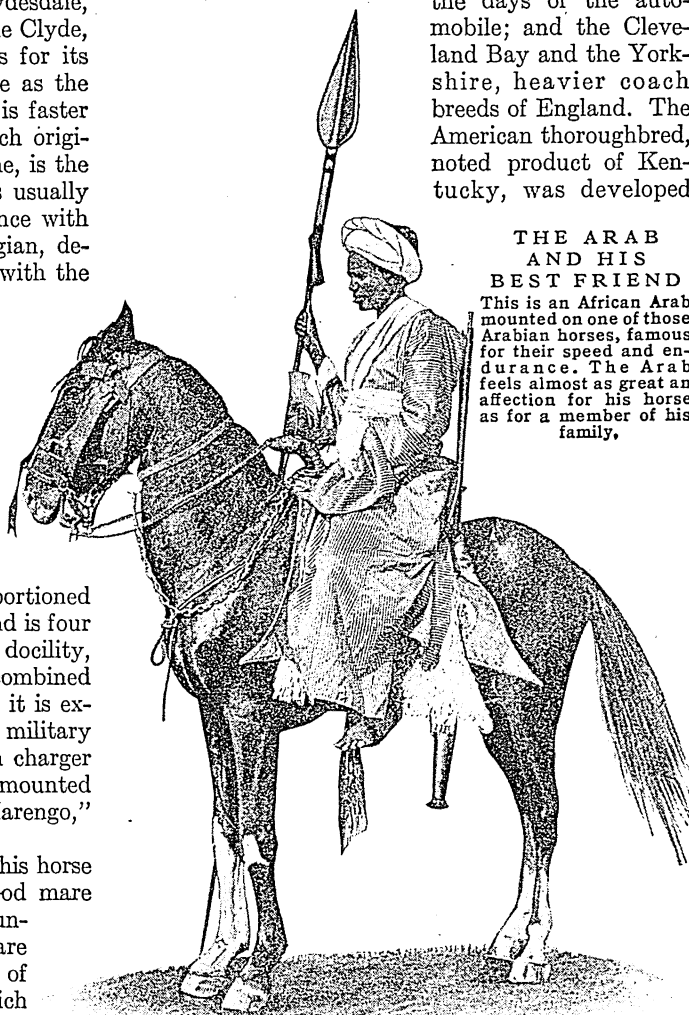
however, as early as 1500 B.C., possessed horses which seem to have resembled the modern Arabian horses, while those that appeared in Babylonia, Palestine, and Greece about that time were coarse, thickset animals. Classical literature, moreover, proves that about 1000 B.C. North African horses were highly esteemed for swiftness of foot and eagerly sought for by the Mediterranean nations. The Barb from Morocco is perhaps as famous as the Arab itself, and the historically noted Irish hunters were derived from Spanish horses of Barb descent.

The Thoroughbred or running horse was developed early in the 18th century from old English stock improved with Arab or Barb blood. It is a powerful animal of great speed, noted as a jumper and cross-country worker, but is nervous and sometimes hard to manage. This breed has contributed to the improvement of many of our present-day horses, including the American breeds; the Hackney, that extravagantly high-stepping English carriage horse fashionable before

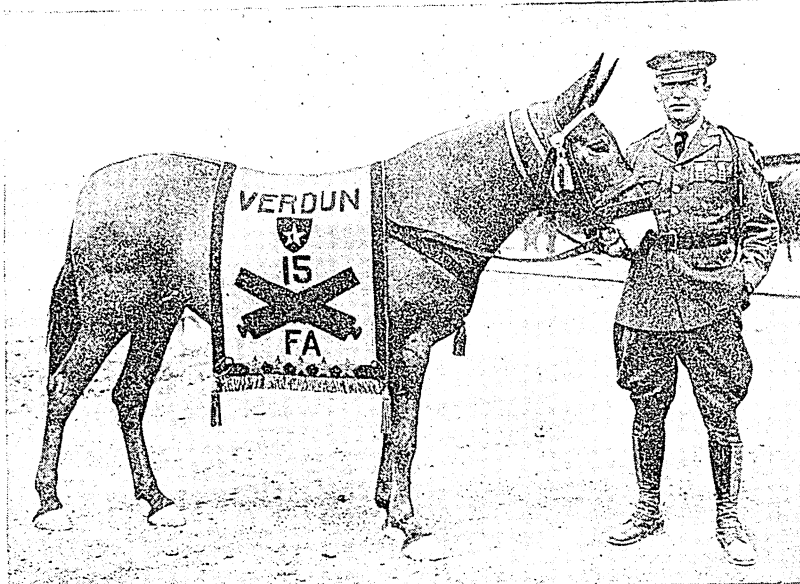
the days of the automobile; and the Cleveland Bay and the Yorkshire, heavier coach breeds of England. The American thoroughbred, noted product of Kentucky, was developed

THE ARAB AND HIS BEST FRIEND

This is an African Arab mounted on one of those Arabian horses, famous for their speed and endurance. The Arab feels almost as great an affection for his horse as for a member of his family.



THE MULE, A VALUABLE WORKER



Mules inherit the shape and size of the horse and the head, long ears, and small hoofs of the ass. They possess a combination of sturdiness, intelligence, and efficiency that proves their worth under pack or in harness. This is "Mademoiselle Verdun," pride of the 15th Field Artillery, one of the 45,000 mules that served with the United States Army in France.

from the English thoroughbred, but was selected for speed over shorter distances.

The Standard Bred, the first breed established in America, was so named because it was developed to perform according to a standard—the ability to trot a mile in 2.30, or to pace a mile in 2.25. Its progenitor was the horse "Messenger," imported from England in 1788. The marvelous improvement in speed records in a century indicates what can be accomplished by proper selection and systematic training. In 1818 the highest speed of a trotting horse was about one mile in 3 minutes. In 1859 this had been reduced to 2.19½, and the present record is under 2 minutes. The pacing record is lower still. These improved records were made by American standard bred horses, the fastest harness horses in the world. They possess remarkable endurance, coupled with long free-striding action, intelligence, and docility. This breed is also known as the American trotter and pacer.

The Morgan breed, renowned for beauty, was developed in Vermont and New Hampshire early in the 19th century, founded on the stallion Justin Morgan, a horse of thoroughbred ancestry. It was the general utility horse of New England and the Middle states during most of the last century.

Another strictly American product is the American saddle horse, developed in Kentucky, Tennessee, Missouri, and Virginia to meet the needs of plantation owners. This beautiful horse is preëminent as a riding horse, and is required to show five gaits.

A pony, strictly speaking, is a horse of reduced size not exceeding 14½ hands in height. Ponies are small and hardy because they were developed in regions of scanty vegetation and unfavorable climate.

The Shetland pony, a product of the cold, barren Shetland Islands, never exceeds 10½ hands in height. Originally a miniature draft horse, it has become the favorite harness or riding horse for young children. Its fine head, long shaggy mane, and bushy tail give it a beautiful and distinctive appearance. The Shetland pony possesses great strength for its size, will fatten on almost any kind of food, and is patient and gentle. The Welsh pony is a slightly taller animal.

In frontier days the Indian pony, also called mustang, bronco, and cayuse, was much used by cowboys and United States troopers. It lives on almost anything, and wild herds, now much deteriorated and almost worthless, still roam the waste-lands in parts of the west. The well-bred bronco is still in demand.

The polo pony, like the mustang, is a specialized type rather than a distinct breed. The game of polo requires a strong horse of stocky build, great speed, and strong wind; a mount nimble of foot, quick and clever in turning, and above all, intelligent and able to learn (*see* Polo). Polo ponies once were standardized at 14 hands, but increasing demands for speed have resulted in an animal 15 hands or more in height. Some are pure thoroughbred, some are broncos crossed with thoroughbred, and others are of various breeds mixed with Arab or thoroughbred blood.

To be successful in handling horses one must understand and love them. The horse responds quickly to kind or harsh treatment. A good master never abuses his horse; he treats him as he would his best friend.

Proper feeding and grooming are all-important. A good caretaker removes caked dirt from the horse's coat with a currycomb, then brushes the body vigorously, and finally rubs it down with a soft rag. He brushes in the natural direction of the hair, beginning with the neck and working towards the rear. The man who knows horses approaches them on the "near" or left side. He warns the horse of his presence by talking to him quietly, and never approaches a strange horse from the rear or front.

The standard horse feeds are hay and grain; timothy is the best hay, and oats the preferred grain. A mixture of timothy and clover and a combination of oats and corn is also used. The average horse is allowed 10 to 12 quarts of oats and 10 to 12 pounds of hay each day. Carrots or turnips make a special tidbit, and wheat bran is given as a conditioner to horses "off their feed." The stomach of a horse holds only 16 quarts, so he must be fed in small quantities but

regularly, three times a day. Rock salt must always be accessible. A horse drinks frequently and needs to be watered before each meal and at least two hours after. It is unsafe for him to drink when overheated.

Various terms are applied to horses, depending on their age and sex. The female is a "filly" when young, then a "mare," then a "dam" when a mother. Her offspring is a "foal"; the male becomes a "colt" when a little older, then a "stallion" or stud-horse. A male that has been unsexed to prevent breeding or for other reasons is termed a "gelding."

The Wise and Patient Mule

The mule, valued from the earliest ages as a beast of burden, is a hybrid animal, being the offspring of a mare and a male donkey or jackass (*see* Ass). It differs from the horse in having longer ears, a short, thick head with a "Roman" nose, small hoofs, and only scanty coarse hair on tail and mane. The color most desired is black, with a tan nose and flank. The hinny, a much inferior hybrid, has a stallion for its sire and a female ass for its dam.

The production of mules in the United States dates back to colonial times. George Washington bred them at Mount Vernon, using for a sire a donkey presented by the king of Spain. Texas, Missouri, Kansas, and Oklahoma now lead in raising mules.

The mule surpasses the horse in endurance, and it lives longer. It shows great instinctive wisdom, and is better able to take care of itself. It can stand exposure better than a horse. It is freer from disease, more patient, and more sure-footed. These qualities make the mule especially useful for farm work, military transport, and work in construction and mining camps. More than four million mules are used on farms in the United States. It is the principal work animal on Southern cotton and sugar plantations, and in Mexico, Spain, France, Portugal, and Italy.

Except in the extreme Arctic regions, tropical forests, and regions of great elevation, horses are used almost everywhere throughout the world. Since the introduction of motor vehicles the number of horses in the United States has decreased, but about 11 million are still used on farms and in cities. Iowa, Montana, Kansas, Nebraska, and South Dakota are the banner states for breeding horses.

Scientific name of horse family, *Equidae*; of the domestic horse, *Equus caballus*. Normal life, 18 to 20 years. The molars of the horse are peculiar in that they grow up from the gums as fast as they wear off on the crowns. The grinding surface bears ridges of hard enamel between which are spaces filled with softer dentine and "cement."

HOSPITALS. Money cannot put into the most luxurious home the facilities for scientific care which the poorest can get in a good hospital. There the sick can have the expert care of the best physicians and surgeons, trained nurses in attendance night and day, all the discoveries and appliances of modern science and skill to find out what the matter is and put it right, a trained dietitian to see that they have the proper food—in short, every comfort and care needed to give the best chance for recovery.

The principles of modern hospital organization had their rise, through the genius of Florence Nightingale, out of the ghastly sufferings of the Crimean War, as did the profession of nursing, without which the modern hospital could not exist. A few years later the chemist Pasteur discovered the relation of germs to putrefaction, and the great surgeon Lister, applying Pasteur's discoveries to surgery, revolutionized operating room practise by the use of antiseptics. Almost every year since then has seen some advance, great or small, in medical science and hospital practise.

Most American general hospitals have, in addition to free wards, provision for paying patients in semi-private wards, and often luxuriously appointed private rooms. In the United States there are federal hospitals (chiefly for the army and navy), state, county, and city hospitals; public hospitals founded by private endowment; public and private hospitals supported by churches, industrial corporations, and fraternal and benevolent societies; and private hospitals for the patients of individual physicians and surgeons.

Good and Bad Hospitals

The United States has some of the finest hospitals in the world—and some of the worst. The American College of Surgeons has attempted to "standardize" American hospitals according to certain principles, of which the most vital are the following: adequate diagnostic laboratory facilities (because no patient can be properly treated until the doctor *knows* what is the matter); the keeping of adequate case records (because it is not possible to keep medical practise up to its highest level without proper "bookkeeping" on the treatment used and the results obtained); and prohibition of secret "fee-splitting" between physician and surgeon or specialist.

Several states now will not grant a license to practise to a medical graduate until he has spent a year or more as an "intern" in some recognized hospital, where he works under the supervision of the staff physicians and surgeons. Interns usually receive their maintenance but no salary, their services being regarded as a fair return for the educational value of the experience they gain.

Most general hospitals conduct training schools for nurses. In view of the difference in value of the training given by different hospitals—and particularly of the absolute worthlessness of training given by some so-called hospitals—it is wise to get very full information about a hospital from different sources before enrolling as a student (*see* Nursing).

Dispensary and outpatient work for patients not confined to bed is increasingly important in the general hospital. Pay clinics for people with small means who do not wish to be objects of charity have met a great need.

In addition to general hospitals, there are a number of hospitals devoted to special classes of disease, such as children's diseases, nervous and mental diseases, tuberculosis, cancer, etc. Sanitariums are for the residential treatment of chronic conditions.

HOUSTON (*hūs'ton*), SAM (1793-1863). Sam Houston, more than any other one man, helped Texas win independence from Mexico and later become a part of the United States.

Born near Lexington, Va., Houston moved to Tennessee at the age of 13, and for several years lived among the Cherokee Indians. In the War of 1812 he formed a lifelong friendship with Gen. Andrew Jackson, under whom he served against the Creek Indians. In 1818 he resigned from the army to devote himself to the study and practise of law. He served Tennessee as United States congressman (1823-27) and as governor (1827-29).

In 1832, Jackson sent him to Texas to deal with the troublesome Comanche Indians. While there he became commander-in-chief of the Texas troops. He was in command at the Battle of San Jacinto, April 21, 1836, in which Texas won independence from Mexico. He presided over the convention which framed a constitution, and, as president of the new republic (1836-38, 1841-44), he worked unceasingly for its annexation to the Union.

When Texas became one of the United States in 1845, it honored Houston by electing him United States senator, a post which he held until 1859, when he became governor. It was against his judgment that Texas seceded from the Union in 1861; and when he refused to take the oath to support the Confederacy, he was deposed from office. Houston died in 1863 without seeing the Union restored.

HOUSTON, TEXAS. In one decade, between 1920 and 1930, Houston, in southeast Texas, doubled its population and became the largest city in the state as well as one of the busiest seaports in the country. Exploitation of the rich Gulf oil fields and the completion, in 1914, of the Houston Ship Channel to the Gulf of Mexico were the chief factors in the city's growth in population and trade.

Houston is about 50 miles inland. Buffalo Bayou, on which the city was built, was originally a shallow, winding stream. Now a channel 34 feet deep and from 200 to 400 feet wide has been dredged down this bayou, down the San Jacinto River, and across Galveston Bay to the Gulf of Mexico, so that the largest cargo ships and oil tankers can go from Houston's busy wharves to ports in all parts of the world. The port also has a

heavy coastwise trade. Railway lines bring in freight for these ships from Mexico, the lower Mississippi Valley, and the West, as well as from the rich lands around Houston; and long pipe lines bring to the Houston refineries heavy oil from fields as far away as Wyoming.

The city is a great shipping port for cotton, cottonseed-oil, rice, lumber, refined sugar, petroleum, and petroleum products. It is also a financial center of the Southwest, the headquarters of oil companies operating in the Gulf fields, a leading market for spot cotton, rice, and lumber, and a busy manufacturing center. A wide variety of products is manufactured in the railway shops, petroleum refineries, cottonseed-oil, rice, flour, and textile mills, foundries and machine shops, chemical, cement, and fertilizer works, packing houses, and wood-working plants. Abundant power for these industries is drawn from near-by oil and gas fields or supplied by electricity or lignite.

Houston is far enough south for magnolias, palms, and roses to grow the year round, and buildings gleam white and fresh under the southern sun. The city bristles with skyscrapers, and life moves with the business-like efficiency typical of the new South. The streets, wide and straight, are lined with attractive shops and homes in Spanish style. Farmers bring in their produce to sell at the "market square," which was made by shifting the course of Buffalo Bayou.

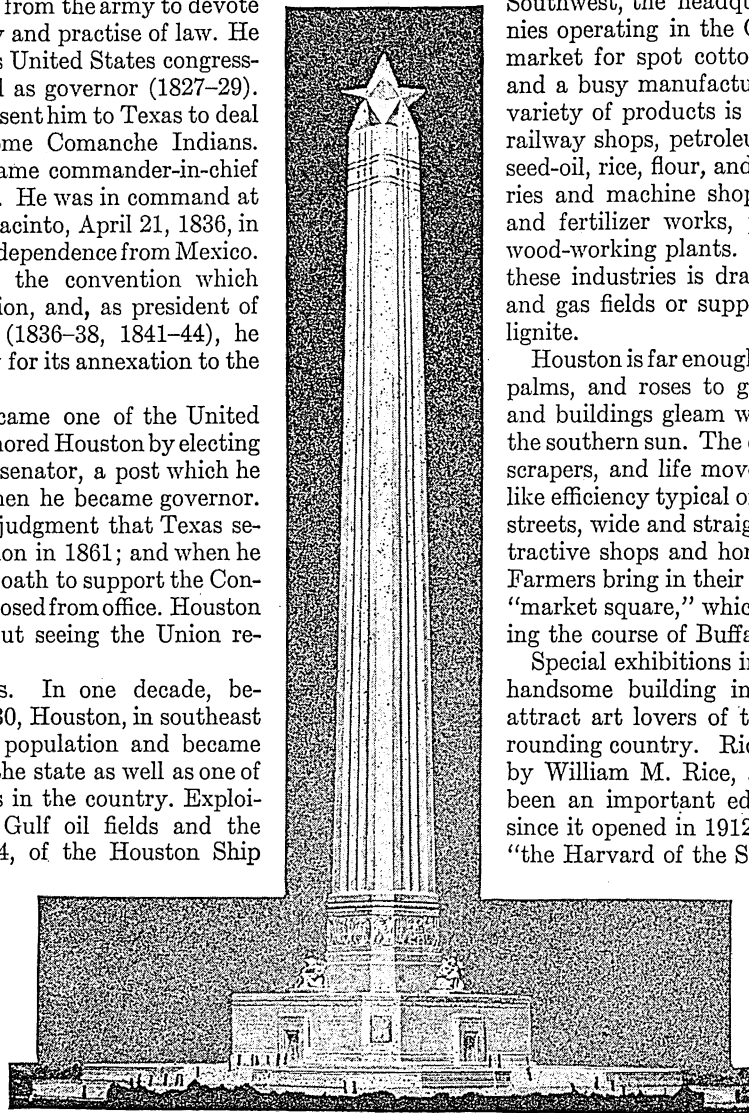
Special exhibitions in the art museum—a handsome building in the classic style—attract art lovers of the city and the surrounding country. Rice Institute, endowed by William M. Rice, a Texas pioneer, has been an important educational institution since it opened in 1912. It has been called "the Harvard of the South."

Houston was one of the first cities of the country to establish junior high schools. Its splendid public school system includes a junior college, as well as the University of Houston.

The city, named for Gen. Sam Houston, was set-

tled in 1836. It was the capital of the Texas Republic from 1837 to 1839, and again in 1842. In 1943 a city-manager replaced the old commission form of government. Population (1940 census), 384,514.

HOWE, ELIAS (1819-1867). Although earlier inventors had discovered the basic principle of the sew-



This beautiful memorial of the Battle of San Jacinto was erected in 1937 on the battlefield, now a state park, 22 miles east of Houston. It is built of concrete faced with Texas limestone. The shaft rises 564 feet above the ground, and an elevator runs to an observation room near the top. The base building contains a hall of honor, a historical museum, a meeting hall, and an art gallery. Behind it is a large amphitheater.

ing machine, Elias Howe invented the first practical machine to be marketed (*see* Sewing Machine). For years he struggled on in poverty before he could gain recognition for his invention. And when it was finally accepted, "sewing machine riots" occurred among hand workers who thought it would take away their means of livelihood.

Elias Howe was born in Spencer, Mass., where he worked on his father's farm and in his grist-mill, attending the district school during the winters. As a boy he was frail in health and slightly lame; but his physical weakness was balanced by an extra share of Yankee ingenuity. At the age of 17 he left his home to work in a factory for cotton machinery at Lowell. Later he worked in a machine shop in Cambridge, and then in Boston, where he married.

Howe wondered if there could not be machines made for sewing, as well as those for spinning and weaving with which he was so familiar. In 1843 he began to work on his first sewing machine, and a year later he had completed a machine that would sew a fairly good seam. With money lent to him by a friend he was able to perfect it and to obtain a patent. Then he tried to sell it. He tested his stitcher against five seamstresses chosen for their speed, and they admitted that it sewed faster and better than all of them. People admired the ingenuity of the invention, but no one would invest in it.

Finally Howe tried to sell it in England, and succeeded in getting about \$1,200 for his patent rights for Great Britain. After paying his debts he returned home penniless, to find that during his absence unscrupulous Americans had seen the value of his machine and that several imitations were on the market. He was forced to go to court to establish his rights in the invention, which were fully conceded in 1854. Then the value of the sewing machine became apparent, and before his death Howe's royalties reached as high as \$200,000 a year. He renewed his patent in 1860, but in 1867 his request for a second extension was denied.

Howe was not merely an ingenious inventor but also a true patriot. He organized and equipped the 17th Connecticut volunteers during the Civil War, and served with them as a private. The hard life undermined his frail constitution, and he died in 1867. **HOWELLS, WILLIAM DEAN** (1837-1920). The title "Dean of American Letters" was bestowed on William Dean Howells in recognition of his long and distinguished services to literature. One of his first books

was a 'Life of Lincoln', which he wrote for the presidential campaign of 1860; and his literary activity continued unbroken up to the time of his death in 1920.

He knew personally Longfellow, Hawthorne, and Lowell, in the golden age of American literature, and he outlived his friends Henry James and Mark Twain and many lesser contemporaries.

Howells grew up in close touch with the commonplace yet interesting life of the average Middle Western Americans. He was born at Martin's Ferry, Ohio, of Welsh-Quaker ancestry. He spent his boyhood at Hamilton, the town he described in 'A Boy's Town', and in other towns in the peaceful Ohio Valley.

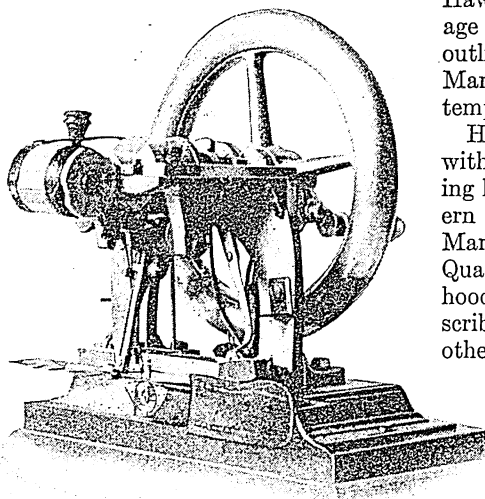
He was fond of recalling these early days, when his father's printing-office was his school. His first attempt at literature, he tells us in his book of reminiscences called 'Years of My Youth', was not written, but was set up directly in type and printed.

From 1861 to 1865 he was the United States consul in Venice. After his return to this country he was for a time on the staff of the *New York Times* and of the *Nation*. In 1866 he went to Boston, where for 15 years he was connected with the *Atlantic Monthly*, first as assistant editor and then as editor-in-chief. Returning to New York, he was associated with other leading American periodicals. Chief of these was *Harper's Magazine*, for which he wrote 'The Editor's Easy Chair' from 1892 until the end of his life.

As a master of literary style Howells has few superiors. "For 40 years his English has been to me a continual delight and astonishment," Mark Twain once wrote; and another critic said, "He never wrote a sentence that anyone else could make better."

As a novelist, Howells' strength lay not only in his easy style, but also in his fidelity to truth, the painstaking care with which he revealed the everyday life of the average American. He was a true realist, but unlike many of this school, he did not dwell upon the seamy side of life. Nor did he confine his work to novels, for he wrote a great number of amusing little farces, several volumes of verse, delightful familiar essays, books of travel, and much sound literary criticism. He exercised a strong and wholesome influence on American literature not only in his writings, but also through his fine sympathy and his sane and high-minded attitude toward literature and life, as critic and editor, as the friend and adviser of younger writers. Although self-educated in the sense that he never attended college, he received honorary degrees from Oxford, Yale, Columbia, and

THE FIRST SEWING MACHINE



That new suit of yours would have cost twice as much if it hadn't been for this little hand sewing machine which is now in the Patent Office at Washington. It is the model of the first sewing machine ever built.

Princeton universities. He was president of the American Academy of Arts and Letters from its foundation in 1904, and in 1915 was awarded the gold medal of the National Institute of Arts and Letters "for distinguished work in fiction."

The following are a few of Howells' best novels: 'Their Wedding Journey' (1871); 'A Foregone Conclusion' (1875); 'The Lady of the Aroostook' (1879); 'A Modern Instance' (1882); 'The Rise of Silas Lapham' (1885); 'Indian Summer' (1886); 'A Hazard of New Fortunes' (1889); 'The Kentons' (1902).

HUDSON BAY. Away up in northeastern Canada lies the third largest landlocked sea in the world, a huge blue patch on the map. This is Hudson Bay—a mighty gulf whose icy waters cover 500,000 square miles, reaching up north into the Arctic Ocean by means of the Foxe Channel and Fury and Hecla Strait, and out east into the Atlantic through Hudson Strait, a deep gorge grooved out of solid rock.

It is a lonely sea—this "Mediterranean of the North"—for, although never entirely frozen over, it is so obstructed by drift ice that only during summer can boats safely plow its icy waters, where—

In the placid inter-ocean's swell
The white whales blow and the porpoises dwell;
And where the far north wind and sea
Chant dirges of eternity.

In the short open season the Hudson's Bay Company's steamers find their way up there to load with millions of dollars' worth of furs. Then too the Indians living in scattered bands near the shore venture out after the vast shoals of seals, porpoises, walrus, and whales, and fish for the cod, salmon, and many other edible fishes, while here and there steam whalers worm their way through ice floes, and Eskimos' skin kayaks shoot out on the water like sea birds.

Save for a few trading stations and scattered settlements, the low shores—low except for certain high bluffs on the east and northeast—are the haunts chiefly of caribou and musk ox, of ducks and loons and ptarmigan. But it is believed that the whole region—whose soil and timber and minerals have as yet scarcely been drawn upon—will open up since the completion in 1931 of the new port of Churchill. This port and the Hudson Bay Railway, which together cost about \$50,000,000, open a route from Canada's wheat area to the Atlantic seaboard 500 to 1,000 miles shorter than the Montreal route.

The Nelson, the Churchill, and the Severn are the most important of the 30 rivers which flow into Hudson Bay. The bay is about 70 fathoms deep, and it contains several islands, the largest of which is Southampton Island at the north end. The entrance is so near the Magnetic Pole that the compass needle is unreliable. The Cabots entered Hudson Strait in 1498, and several Elizabethan mariners during the following century did likewise. The bay itself was not explored until Henry Hudson reached its southern limit in 1610.

HUDSON, HENRY (1575?-1611). In the year 1909, three centuries after the great English navigator Henry Hudson had explored the Hudson River, a

strange, bright-colored vessel lay anchored just opposite New York City. The occasion was the Hudson-Fulton memorial celebration. The ship, an exact replica of Hudson's *Half Moon*, had been sent by Holland to New York, where appropriate ceremonies were carried out. Then the little ship went on up the river, heralded by the different towns along the way.

The ship was like some strange outlandish bird among its sober neighbors, the swift motor launches and gray steamers of our day. It was itself hardly larger than a good-sized launch, and the main deck was raised only a few feet above the water, so that except on the smoothest days the men must have remained between decks. The stern of the vessel rose in a steep poop and the bow was raised in a curve like a half moon, from which the ship perhaps took its name. In the dark narrow space between the decks, where the men lived, there was not room to stand erect or even to lie at full length.

To visit this vessel was to understand something of the hardships and dangers endured by the old sea adventurers; and something too of the conditions which led to the mutiny by which Hudson met his untimely end in one of the saddest crimes in history.

We know nothing of Henry Hudson's life before his four voyages between 1607 and 1611. All of these were made for the purpose of discovering northeast or northwest passages to China, to reach the rich trade of the Orient. His first and second voyages were for the Muscovy Company, an English trading company. During the first he explored the coasts of Greenland and Spitsbergen. During the second he reached Nova Zembla, trying in vain to force a passage through the ice-locked Kara Strait.

The third voyage, for which the *Half Moon* was built, was for the Dutch East India Company of Holland. During it he explored (1609) the river which bears his name, with the vain hope that it might lead to the Pacific Ocean. The last voyage was for an English company formed especially for the purpose. Again in the *Discovery* he set sail in 1610, passed through the strait which bears his name, and explored and charted Hudson Bay. Winter overtook him, and he and his men endured terrible hardships from cold and lack of food on this inhospitable shore.

Discontent and mutiny smoldered, and in the spring broke out in a flame. Hudson was overpowered and, together with his young son, the ship's carpenter, and several sick men, was cast adrift in a small boat. The boat was never heard from again, and we can only guess at its ultimate fate, and the tortured love of that intrepid father, as he saw his son sinking into that death which he too must face. The ring-leaders of the mutineers were killed by the natives. Others won their way back to England with Hudson's records, and were there tried for murder.

Hudson's services were of inestimable value in extending geographical knowledge, and they also bore fruit in developing the rich fisheries of Spitsbergen and the fur trade of the Hudson Bay region.

HUDSON CAST ADRIFT TO PERISH IN THE ARCTIC



"Hudson's last voyage was for an English company. Again in the 'Discovery' he set sail in 1610, passed through the strait which bears his name, and explored and charted Hudson Bay. Winter overtook him and he and his men endured terrible hardships from cold and lack of food on this inhospitable shore. Discontent and mutiny smoldered and in the spring broke out in a flame. Hudson was overpowered and, together with his young son, the ship's carpenter, and several sick men, was cast adrift in a small boat. The boat was never heard of again."

HUDSON RIVER. Fascinating legends, interesting stories of history, and picturesque scenery combine to make the Hudson River one of the most renowned rivers in the United States. The excellent harbor which its mouth affords has caused New York City to become the greatest city of the New World.

Rising in the heart of the Adirondacks in the north-eastern part of the state, the Hudson is at first narrow, winding, and rock-obstructed, and then flows past wooded hills and cultivated slopes until it reaches tide-water at Troy. Here it is joined from the west by its chief tributary, the Mohawk. From Albany down it is like a long arm of the sea, broad, stately, and friendly. The Catskill Mountains, made famous by Washington Irving, rise in varied and mystic beauty on the west side of the river. Lower down the Hudson enters the Highlands, the scene of Arnold's treason and Andre's death, a region of ancient rock-ribbed hills and mountains. The United States Military Academy at West Point and the ruins of Fort Putnam are situated a few miles below. Emerging from the Highlands near Stony Point, where "Mad Anthony" Wayne stormed and captured the British stronghold, the river expands to form the Tappan Sea (or Bay). Thence the Palisades, a wall of rock 300 to 500 feet high, majestic and awe-inspiring, extend 20 miles along the New Jersey shore. Just south, near Weehawken, the Burr-Hamilton duel was fought. The banks of the much traveled waterway, once covered by forests, are dotted with towns, hamlets, and country estates, until New York City's many docks and wharfs are reached. Then the river empties into New York Bay, 306 miles from its mountain source.

An Aid to Early Development

The Hudson River was first explored in 1609 by Henry Hudson, from whom it gets its name. In early days the name North River was often applied to it, in distinction from the Delaware or South River and this name is still given by New Yorkers to its lower part. Since the Hudson furnishes the only deep waterway through the Atlantic highlands open to large vessels, it greatly aided the early commercial and industrial development of New York. Before railroads were built it carried nearly all the traffic from the fertile country of the west and north. The first successful attempt at steam navigation was made by Robert Fulton on this stream, and with the opening of the Erie Canal from Troy to Buffalo in 1825 a continuous waterway connected New York City and the North Central states. Ocean-going vessels still travel up as far as Troy, where they are loaded with freight which has come by water from Duluth or other western points through the Great Lakes and down the Erie Canal. The falls and rapids furnish electric power which is used as far away as the coal fields of Pennsylvania.

HUDSON'S BAY COMPANY. Scattered over the vast northern regions of Canada, almost up to the shores of the Arctic Ocean, lie the fur-trading stations of the great Hudson's Bay Company. In those soli-

tary outposts of civilization, which are still remote from the gradually extending transportation routes and where the sight of a new face is an event long to be remembered, agents of the company with their families live the same isolated lives which their predecessors have lived for more than two centuries. In the spring the Indians and half-breeds bring in the stock of furs accumulated by the winter's trapping, to barter for food, weapons, and clothing. These are then carried, in canoes or light-draft steamboats, to posts in Hudson Bay for transportation to England in the company's ships, or to railway terminals in the south, whence the furs go overland to some Atlantic port for shipment.

Boundless Wealth in Furs

The early history of northwestern Canada is the history of the Hudson's Bay Company and its rivals. Their trading posts were the first settlements in the western plains, around which many a thriving city has grown. The Hudson's Bay Company dates from 1670, when Prince Rupert of England set about realizing the visions of boundless wealth inspired by the success of Pierre Radisson, a French Canadian adventurer who had, seven years before, brought to Quebec a cargo of 60,000 beaver skins, worth half a million dollars. With 17 associates the prince obtained from his cousin, King Charles II of England, a charter giving them the sole rights of trade in the unoccupied lands which drain into Hudson Bay. It was many years before men realized the vast extent of this grant. No one supposed it included a territory more than a few hundred miles in breadth, and years of exploration were necessary before it was discovered that "Rupert's Land" included nearly all of the present provinces of Manitoba and Saskatchewan, a large part of Alberta, and even certain territory now a part of the United States.

But vast as the company's holdings were, wealth did not come rapidly, at first, because the company had to contend with French rivals from Canada. With the acquisition of French Canada in 1763 this obstacle was removed, but a rival company—the Northwest Company—sprang up; and until the union of the two in 1821 their employees were sometimes engaged in actual warfare.

The Hudson's Bay Company had something more than mere trading privileges, for it owned the land and governed the people also. This arrangement was found intolerable when settlers moved into the region, and in 1869 the company was forced to surrender most of its privileges, though it was paid \$1,500,000 and allowed to keep its forts and large tracts of land. It is today a wealthy trading corporation, with nearly 150 trading posts, although it no longer has the exclusive rights that it once claimed.

HUGHES, CHARLES EVANS (born 1862). Chief justice of the United States, member of the World Court, secretary of state, and governor of New York state, Charles E. Hughes has been a national figure for many years. He was born in Glens Falls, N.Y.,

the son of a clergyman of Welsh descent. He received his A.B. from Brown University in 1881, then taught school while studying law, and going to New York City was graduated in law from Columbia University in 1884, being admitted the same year to the bar.

He first attracted wide attention in 1905-06 by the searching way in which he conducted the investigation for a committee of the New York legislature of the great insurance companies, in several of which scandals had become notorious. Before this Hughes had become a marked figure in New York state by a similar investigation of New York gas rates, then just concluded. He accepted the new commission on condition that he should be absolutely unhampered. His freedom from bias and his extraordinary capacity for analysis of monumental masses of detail, as well as for hard work—sometimes 20 hours a day—appeared in the results. Most of the recommendations made in the report he drafted were later enacted into law.

Elected governor of New York state on the Republican ticket for two successive terms (1907-08, 1909-10), Hughes showed the same vigorous courage in forcing a reluctant legislature to pass various reform measures, which included an anti-race-track gambling law, a direct primary law, and particularly a law creating a public service commission, the outstanding achievement of his administration. He abolished "back stairs" influences, refusing private interviews to influential politicians; and "cleaned house" by eliminating honest but incompetent officeholders as ruthlessly as the corrupt ones, without regard to party services in either case. A firm believer in the party system, he was too honest, too uncompromising, and too deficient in the arts of popularity to become a party leader.

Governor Hughes resigned his office in 1910 to accept an appointment from President Taft to the United States Supreme Court—a position admirably suited both to his tastes and to his abilities. He ranked as one of the ablest men on the bench, and, so long as he sat there, he remained absolutely disinterested from politics.

It was undoubtedly much against his own inclination that he resigned his position on the Supreme Court bench to accept the Republican nomination for the presidency against President Wilson in 1916. The party platform was vague with reference to the war, and the campaign centered on bitter attacks on Democratic policies. Whether for this or for other reasons, many of Mr. Hughes' admirers felt that his campaign did not add to his reputation. He was defeated in November (*see* Wilson, Woodrow), and returned to the practice of law. In 1918 President Wilson appointed him to conduct the investigation

of charges of extravagance and corruption in the building of airplanes for the army and navy.

From 1921 to 1925 Hughes served as secretary of state, and handled many momentous issues, including the peace treaty with Germany and the Washington disarmament conference. In 1926 President Coolidge

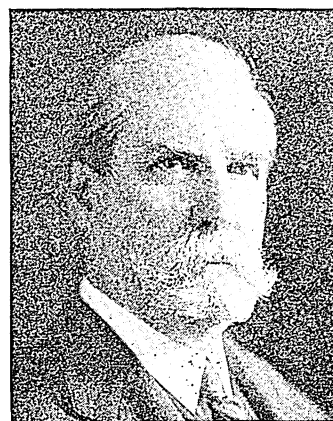
appointed him to the Hague Court of International Arbitration, and in 1928 he was elected a judge of the World Court. Two years later he was appointed chief justice of the United States. In 1941 he retired at the age of 79.

HUGHES, SIR SAM (1853-1921). As Canada's minister of militia and defense at the outbreak of the World War in 1914, Lieutenant-General Hughes raised and equipped for overseas service a very large part of the 600,000 men that Canada contributed in that gigantic conflict, and they were said to be among the best of all the British forces. A man of force and energy, he showed an ability

in organization that amounted to genius. He recognized no obstacles, either for himself or others. If anyone complained that the task he set was impossible, his reply was: "Nothing is impossible. Do it."

Born on a farm in Ontario, of Protestant Irish stock, young Hughes enlisted in the militia in his 13th year, and at the age of 17 won a medal for service against the invading Fenians, who were seeking the overthrow of the British government in Canada. He was educated at the Toronto Normal School and Toronto University, and taught school for a number of years. Then he took up newspaper work, purchasing the *Lindsay Warder*, which he edited himself until 1897. In 1892 he was first elected to the Canadian House of Commons, and from that time he played a prominent part in public affairs. One of the principles he strongly advocated was that the Colonies should assist the Empire in time of war. During the South African War he offered his assistance in raising troops, besides serving in the intelligence and transportation departments. He was several times mentioned in dispatches.

Ever since his youth, he had made a special study of military affairs, and had risen in rank from private to lieutenant-general of militia. His political and military knowledge and experience fitted him for the office of minister of militia, to which he was appointed in 1911. In spite, however, of the splendid results he obtained as an organizer, and the esteem which he gained at first, his administration of the militia office was bitterly criticized. He was charged especially with being rash and arbitrary in his actions, and these attacks led to his resignation of his office in 1916. The British government rewarded him for his services by creating him a Knight Commander of the Bath.



CHARLES EVANS HUGHES
Statesman and Reformer

HUGO, MASTER of POETRY and ROMANCE

HUGO, VICTOR (1802-1885). On June 1, 1885, Paris celebrated the most magnificent funeral of the century. In a pauper's hearse, the remains of Victor Hugo, the sovereign poet of France, were carried for burial to the Panthéon. The pauper's hearse, which Hugo had requested in his will, was a symbol of his brotherhood with *les misérables*, "the unfortunates."

In his life, however, Hugo had enjoyed worldly success and fame without a parallel among writers. "No one," said Emile Montegut, "has stirred so much wrath, furnished pretext for so many literary civil wars, roused such fanatical enthusiasms, kindled such unshakable devotions." Once in his hearing, regret was expressed that Paris was not re-christened *Hugopolis*. "That will come," malice reports Hugo to have said. Such was the extravagance of Hugoworship at the time of his death, that his enterprising valet was able to sell four hundred pairs of trousers that he swore had all been worn by Hugo.

There was an imperial vigor about the man and his manifold works. He ate his meat almost raw, he liked to bathe in ice water, and in his 83 years he never lost a tooth. His will was iron, and his capacity for work was incredible. "Take a moment's rest? Impossible!" he used to say. "A little work bores me, but much work is a pleasure." For more than 60 years he worked, prodigiously and with frenzy.

Parentage and Early Years

Victor Hugo was born at Besançon in eastern France, Feb. 26, 1802. On his mother's side he sprang from shipowners; on his father's, from a carpenter. Between his mother, who was a professed royalist, and his father, who was a supporter of Napoleon, there was a lack of understanding that ended in a separation when Victor was in his teens. From his mother, whom he adored, Victor learned to waste little love either on Bonaparte or on his father, Gen. Joseph Léopold Hugo, who was an officer in Napoleon's army. During the early years of Victor's

life, while his father was fighting or doing garrison duty here and there, Madame Hugo was in Paris with her three sons—Abel (born 1798), Eugène (1800), and Victor. His fifth year was spent in Italy with his father, who was now governor of a province and chief adviser to Joseph Bonaparte, Napoleon's brother.

Barely had the Hugos begun to get settled in Italy when Napoleon conferred upon Joseph Bonaparte the crown of Spain. General Hugo went to Spain with him, and Madame Hugo took her boys back to Paris. There she rented a roomy old house with a huge garden full of trees. This property, once part of the ancient convent of the Feuillantines, had run wild. It was as if it had slipped out of the covers of some Gothic romance and dropped there by some caprice of enchantment. In this enchanted garden, Victor had for playmate a little girl, Adèle Foucher, who later was to be his wife.

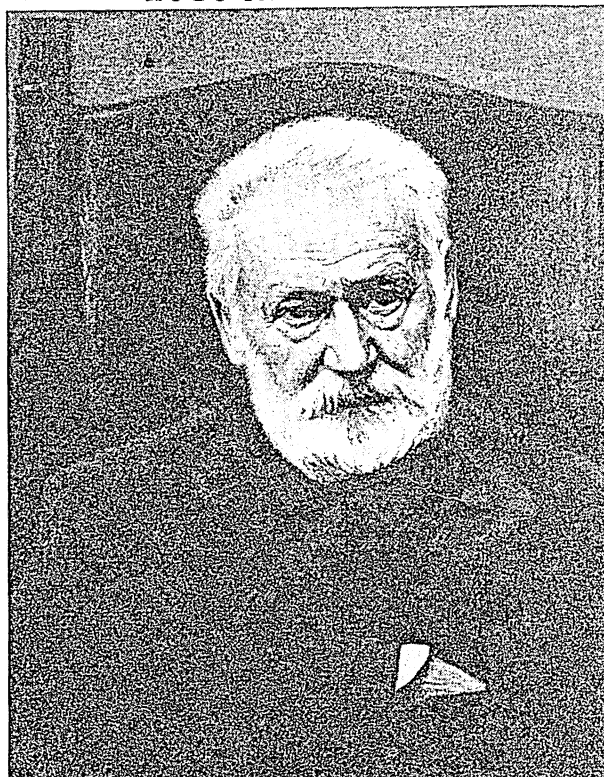
Meanwhile, in Spain, Victor's father also was living in a kind of fairy tale. Overnight he had been created general of the staff, governor of Madrid, Count of Cifuentes and Marquis of Sigüenza. The King had given him a million réals and a magnificent palace.

He summoned his family to share his splendor. Abel, the eldest son, became a page at the king's court. Victor, who was now nine, and Eugène, two years older, were entered in a school for young Spanish nobles. Hated as enemies and despised as heretics, the two boys passed several unhappy months in this dreary place.

Reversal of Family Fortunes

It was the defeat of Napoleon's armies in Russia (1812) that broke the nightmare, and released Eugène and Victor to return with their mother to their beloved home in Paris. The same upheaval left General Hugo a poor man, stripped of his titles and reduced in rank. Madame Hugo gave up their beloved garden home and moved into a shabby apartment. The boys were sent off to school. For the next three years Victor enjoyed the only systematic education he ever had.

HUGO IN LATER LIFE



The poet's "imperial vigor" plainly appears in this portrait, painted when he was in his seventies. His snowy-white hair and beard frame his "lion's face," as admirers called it, with its wide and lofty forehead—"one of the finest laboratories of thought in the world." He had a powerful body that rarely knew fatigue or illness.

At school, Victor not only distinguished himself in his studies but found time to read deeply in literature and to write thousands of lines of verse. When he was 15, the French Academy gave him honorable mention in its annual poetry competition. After leaving school, at 16, he devoted himself entirely to literature. The next year he won two prizes in a poetry contest at Toulouse. With his elder brother, Abel, he founded and edited a literary review. Most of the articles and poems were written by Victor himself.

The heartbreak of his mother's death (1821), the hurt at his father's absence from the funeral, and his own lack of means did not break his determination to live—or die—by his pen. He continued to write. His first published volume of poems (*Odes et Poésies diverses*) pleased the King and won for him an annual pension of 1,000 francs (\$200) that later was doubled. It also brought a profit of 700 francs. Then, at 20, he married his childhood playmate, Adèle Foucher.

Poet of Hearth and Home

Marriage brought him four children whom he adored (not counting the first infant that lived only a few months). There was Léopoldine, who from the first hour of her life was her father's darling, and whose death by drowning just after her marriage seared his heart. There was the gay Charles, who gave Hugo two grandchildren that he doted on in later life. There was François-Victor, whose translation of Shakespeare is still the best and most complete version in French. And there was Adèle, of delicate health, but the only one of his children who outlived him. No other Frenchman has written so much tender poetry of childhood and children, the family and the home.

Leader of the Romantic Movement

Out of the happiness of his early married life and the remembrance of the Spain of his childhood, Hugo created a work which brought him spectacular acclaim and his first substantial earnings. The hero of this lyrical melodrama, *Hernani*, is a bandit chief whose heart is passionately given to Doña Sol, the daughter of an ancient race. Unhappily, Doña Sol is promised in marriage to her aged uncle, Ruy Gomez. *Hernani* wins her, but their nuptial hour is the hour of their death.

Hernani (1830) was Hugo's first great triumph. It also marks an epoch in the history of French drama. At the time of its production, the French theater was being strangled by a set of petty and artificial traditions. *Hernani* rudely shattered the traditions and brought fresh new life into French literature. Thus, before he was 30, Hugo was the acknowledged chief of the literary rebellion called the Romantic movement.

It was predicted that his flame would soon burn itself out, but poems, plays, essays, historical sketches, and novels followed one another steadily for half a century more. Hugo had such richness of imagination, such splendor of language, and such command of technique, that he triumphed over serious faults of haste and extravagance.

Hugo was tremendously in earnest as patriot and

social reformer, and many of his works are impassioned criticism of social and political injustice. As a political opponent to Napoleon III, whom he nicknamed "Napoleon the Little," Hugo made himself so dangerous that he had to flee from France.

Twenty Years of Exile

In Brussels and on the island of Jersey, Hugo found only temporary refuge. After 1855, on another island in the English Channel, he enjoyed a worldwide celebrity as "the Exile of Guernsey." There he wrote notable historical papers, poems that are ranked with the greatest achievements of French genius, and novels that were translated into many languages.

Always at the boiling point of fervor, Hugo was often merely violent over the passing event, but he was occasionally carried away by passion to the point of inspiration on themes of universal interest. *Les Misérables* is justly ranked with the greatest novels of all countries; in comparison with it, Hugo's other novels dwindle into secondary importance.

Though Hugo wrote a number of plays, some of which were enthusiastically received at the time, he does not now rate highly as a dramatist. As a poet—especially a lyric poet—he is still honored as the greatest that France has produced. *Les Châtiments* is a collection of his finest lyrical poems.

After the fall of the empire of Napoleon III in 1870, Hugo returned to Paris, where he lived a popular idol for another dozen years. His songs were set to music, his interdicted play *Le Roi s'amuse* (The King's Diversion) was revived, and he was the chief figure of the French Academy. When he died (May 22, 1885) at the age of 83, Parliament gave him burial in the Panthéon—an honor which had been accorded to no one for 75 years.

Books By and About Hugo

Victor Hugo's principal works of fiction are: *Notre Dame de Paris* (1831); *Les Misérables* (1862); *Les Travailleurs de la mer* (Toilers of the Sea) (1866); *Quatrevingt-treize* (Ninety-three) (1874). *Poems and poetic dramas*: *Cromwell* (1827); *Marion Delorme* (1829); *Les Orientales* (1829); *Hernani* (1830); *Le Roi s'amuse* (The King's Diversion) (1832); *Ruy Blas* (1838); *Les Châtiments* (1853); *Les Contemplations* (1856); *La Légende des Siècles* (three series—1859, 1877, 1883).

A good biography of Hugo in English is that by Mme. A. M. F. R. Duclaux. For Hugo as a poet, see 'Victor Hugo', by W. F. Giese. Shorter studies will be found in 'The Twentieth Century Novel', by J. W. Beach; 'Studies in Literature', by E. Dowden; 'Views and Reviews', by W. E. Henley; 'French Dramatists of the 19th Century', by B. Matthews; 'Titans of Literature', by B. Rascoe; 'Main Currents of Modern Drama', by H. A. Smith; 'Familiar Studies of Men and Books', by R. L. Stevenson.

A Masterpiece of
World Literature,
'Les Misérables'

VICTOR HUGO was 60, and at the zenith of his power, when he wrote his masterpiece, *'Les Misérables'* (*lā mē-zā-rā'blū*).

He was in exile in Guernsey, in protest to the world against Louis Napoleon's betrayal of the Republic and usurpation of monarchy. In his democratic sympathies he was indignant at the misery that infests the

slums of great cities, and the great cost in social injustice, labor and sweat and heartbreak on which the superstructure of civilization is built. (*Misérable* is both a noun and an adjective, meaning "wretched," "unfortunate"; and the untranslatable title of Hugo's novel means something like "The Dregs of Society.")

'Les Misérables' is a study of French society in the first years after 1830, when Hugo was young. In the character of Marius, Hugo gives a picture of his own early manhood. The hero, Jean Valjean, is a convict on whom 19 years of prison life have branded an indelible scar. He steals the cherished silverplate of a benefactor; he seizes a small coin from a little chimney sweep. Repenting, he is transformed into a man of honesty and honor. Years later he learns that an innocent man is accused of the theft that he thought he had atoned for by years of charity. After an agony of inner struggle he gives himself up and is returned to a convict ship. He escapes, adopts a little seven-year-old waif, Cosette, and gives her a place in the sunshine. She and Marius later fall in love, and Jean Valjean faces the bitter realization that he must relinquish her. Out of devotion to her he risks his life to save Marius, who has been wounded in the revolution of 1832. In one of the most unforgettable scenes of the book, he carries the almost lifeless form of Marius through the underground sewers of Paris. Having assured happiness to these children of his choice, he dies neglected and broken-hearted.

Around this structure of plot, Hugo has created a work of immense richness and power that is less a novel than a prose epic. It has been called "a vast invention, beautiful, incredible, sublime, absurd, absorbing in its interest, a nightmare in its tedium." In any event, 'Les Misérables' was once voted by popular referendum the greatest novel in the world.

HUGUENOTS (*hū'gē-nōts*). This name, given in the time of the Reformation to the French Protestants, was probably a corruption of the German word *Eidgenossen* (confederates). It was first applied to the Swiss Protestants, with whom the French Protestants had much in common. In their struggles for religious freedom the Huguenots were driven to become a political party, and even a "state within the state," headed by some of the greatest French nobles.

By the middle of the 16th century their numbers and influence had aroused the fears of the Catholic party and the powerful family of Guise. Eight separate religious wars followed. The first war began with an attack by the Duke of Guise and his followers on a congregation of Huguenots assembled for worship in a barn. The peace which concluded the third war was broken by the massacre of St. Bartholomew, the most dreadful of the many crimes that marked this long and distressing era of religious and civil warfare. (See Coligny, Gaspard de.)

The Huguenot wars ended in 1598 when Henry IV—who was formerly a Huguenot, but who later conformed to the Catholic church—issued the Edict of Nantes. The edict gave the French Protestants politi-

cal rights, religious freedom, and the possession of certain fortified towns (see Henry, Kings of France). Their fortresses were lost with the capture of La Rochelle in 1628 (see Richelieu, Cardinal). Although the Edict of Nantes was in other respects confirmed, the Huguenots were still from time to time harassed and persecuted.

When Louis XIV revoked the Edict of Nantes in 1685, all protection of law was withdrawn from the Huguenots. Although they were forbidden to leave France, hundreds of thousands succeeded in escaping. They carried French arts, manufactures, and culture to England, Germany, the Netherlands, and the American colonies, especially South Carolina, New York, and Pennsylvania. France was thereby the poorer, like Spain after the expulsion of the Moors.

The famous opera, 'Les Huguenots', by Meyerbeer, uses the tragic times of the Huguenot persecutions for its background. The hero and the heroine are killed in the massacre of St. Bartholomew. (For further information about this work, see Opera.)

HUMANE SOCIETIES. In April of each year, "Be Kind to Animals Week" is observed the nation over. Schools, parent-teacher organizations, women's clubs, and other societies join with humane societies to think about the protection of animals.

Organized interest in protecting animals began in England more than a century ago. In 1822 Richard Martin, an Irish member of Parliament, brought about the passage of an act to prevent the cruel and improper treatment of cattle. Two years later, a Society for the Prevention of Cruelty to Animals was formed to enforce the Martin act and to help all other animals subject to abuse. After 1835, when Queen Victoria became a patron of the society, its influence grew rapidly and societies were formed in many parts of the world. In 1840, by the queen's command, its name was given the prefix "Royal."

Henry Bergh, an American who became interested in the work of the British society while in London, founded the first Society for the Prevention of Cruelty to Animals in the United States. It was incorporated in 1866 by the legislature of the state of New York. During its first year it succeeded in having legislation passed in the state regulating the shipment of live stock. More than a thousand local societies have since been formed.

In 1874 Bergh founded the New York Society for the Prevention of Cruelty to Children. This is said to be the first organized movement for the protection of children in the United States. A great step toward unifying the work was taken in 1877 with the formation of a national organization, the American Humane Association, which has for its object the protection of both children and animals. It succeeded in doing away with such abuses to cattle in shipment as overcrowding and lack of food and water.

Humane societies not only promote laws to protect animals, but they provide animal shelters, water troughs, and hospitals, and conduct educational campaigns to show children how to care for their pets.

LITTLE TALKS
ON GREAT THINGS
by Arthur Mee

HUMILITY

WE SHOULD never be ashamed of humility. In this great world, with all the majesty of Nature 'round about him, the proudest man may well be humble.

A man may boast of his knowledge, but it is as a grain of sand on the seashore compared with what he does not know. A man may boast of his possessions, but it is poverty compared with the wealth that belongs to us all. A man may boast of his talents, but he is helpless when Nature comes to him and says, "Thou shalt not do this." The wisest and richest and cleverest of men have need of great humility.

It will help us all our lives to be humble, to be ready to learn, and not to boast overmuch of the powers that came to us from God, not to bear too proudly the precious gifts we were not responsible for. It will help us to sit at the feet of those who can teach us wisdom; it will never help us to pretend to know the things we do not know.

It will help us to remember always the limit of our powers. We may long and dream, we may press on and achieve; and it is right, in one great sense, that we should never be content, though we need not be forever wanting the impossible. We are wise if we do gladly and well the things that come to our hand, knowing that in this world there is need of many kinds of service, and of well-doing in all. "They also serve who only stand and wait."

It is good to have the strength of a giant, but it is not always good to use it so. It is good to know whatever there is to know, but we need not parade our learning as a jeweler shows his diamonds in a window. There is a great story somewhere of a nobleman's son. There was no wiser man in France, and people came from every part of Europe to meet him. A stranger came on a visit to his father's house one day and stayed to luncheon, and at last the time came for him to go. As he was leaving he thanked his host for the pleasant hours he had spent with him. "Yes, yes," said his host. "But, tell me, you really came, did you not, to see our wonderful son?" And the visitor was compelled to tell the truth, and say how much he would have liked to meet him.

"You sat by him at lunch," said his host. So modest is true wisdom!

It is humility that has given the world its greatest pride. It is the desire to know that has given us all our knowledge. All the glory that is written in books, all the wonder that is painted in pictures, all the immortal music that seems to lift us up to heaven, has come from men who came humbly into the world, went through life in great humility, and were not too proud to learn to serve that they might command, to seek that they might find, to knock that the door might be opened. He is wise who knows, and remembers, that we have come into this world as suppliants, heirs of the wealth that others have bequeathed to us, possessing nothing of our own, but with the mighty privilege of learning to conquer by learning to obey.

There was a great Frenchman named Pasteur. He was to cover his name with the glory that will shine forever in the history of his land, and he wrote to his father at the beginning of his great work praying that he might be able to add one little stone to the temple of human knowledge! He prayed to add one little stone, but in the end he set up a mighty temple in which the human heart will worship as long as the human mind endures.

And, long before Pasteur, there was a great Englishman named Isaac Newton. No man in England knew more than he. A marvelous work he did, astonishing discoveries he made, and all the world is richer because Sir Isaac Newton lived. Yet this great man, one of the greatest men of his time, or of all time, declared that he felt at the end of his life as if he had been picking up a few pebbles on the seashore while the ocean of truth lay unexplored round about him! He had filled the whole world with wonder and set up a kingdom of knowledge, but he felt at the end of it all like a little child picking up pebbles.

So Pasteur begins, so Newton ends, in deep humility, and we do well to be humble, seeing the wonders that they wrought. We need not be ashamed to keep them company; we need not be too proud to pick up pebbles, and so add some little stone as our share of the building up of the glory that awaits us all.



Here is Mother Ruby-Throat and her two babies in a nest in a pitch pine tree.

HUMMING-BIRD. Like a splendid jewel, the tiny humming-bird flashes across a garden at a speed the human vision is unable to follow. Exquisite in form and brilliant in its changeable coloring, this mite is the masterpiece of the whole bird family, though it is usually less than four inches long.

Nature never overdoes, so this tiniest of birds does not sing, but squeaks like a mouse.

Humming-birds belong to the New World exclusively. There are about 500 species, nine-tenths of which belong only to the Amazon and Orinoco valleys in South America. All have long slender bills—sometimes longer than the head, neck, and body together—tiny bodies, brilliant plumage, and marvelously developed wing power.

This extraordinary wing power is the result of the humming-bird's feeding habits. Its food is the minute insects which loiter in the depths of flowers too small to support the weight even of so tiny a creature as the humming-bird. So it has developed very strong wings, which sustain it above the blossom, vibrating so rapidly that they make a humming sound and the eye sees them only as a filmy haze. To enable it to reach far into the deep flower-throats it has developed its long beak and its long tapering double-tubed tongue. This tongue can be instantly extended to an extraordinary length to seize insects in flowers or under the bark of trees. The common idea that the humming-bird lives exclusively on the nectar of flowers is a mistake. With the insects it of course gets some of the nectar, but it is the insects, not the nectar, that the bird is after. Like the bees, the humming-birds are very useful in the cross-fertilization of plants, for bits of pollen cling to their bodies and are carried from flower to flower as the little bird searches for food.

The nest of a humming-bird is a tiny cup-shaped affair, such as a fairy might build, and it is made of quite fairy-like material, plant-down, stuccoed with moss and spider-web. The eggs are pure white and never more than two in number.

In that part of North America bounded by the Mississippi and the Atlantic, Florida and Labrador, only one species of humming-bird is found. But during the summer months that one, the "ruby-throat," is everywhere present. The male measures a trifle under $3\frac{1}{4}$ inches from the end of its bill to the tip of its tail, and the female is nearly four inches long. The upper feathers of the male are the glistening green of an emerald, with changeable amethyst lights over the wings and tail; the under-feathers shade from pearl-gray into the darker upper feathers, and the throat is like a glowing ruby, with all its variations of color. The females are more soberly clad. (For illustration in colors see Birds.)

Yet for all his splendor, the little fellow is very friendly with his human neighbors and likes to perch about their gardens, calmly preening his feathers, quite unconscious of the delight afforded by the sight of such a performance. Despite its tininess, the humming-bird is a fierce little fighter and will even rout a hawk or crow that ventures too near its nest.

In the ruby-throat and also some other species, the little buglike babies are fed with food the mother bird has partially digested and which she pumps

through her bill into the mouth of the fledgling.

Most of the ruby-throats, from as far north as Alaska, winter in southern Mexico or Central America. After migrating to the southern states, these tiny birds some autumn night launch out across the Gulf of Mexico, straight for their winter home 500 miles distant, and, incredible as it may seem, the trip is made without stop for food or rest.

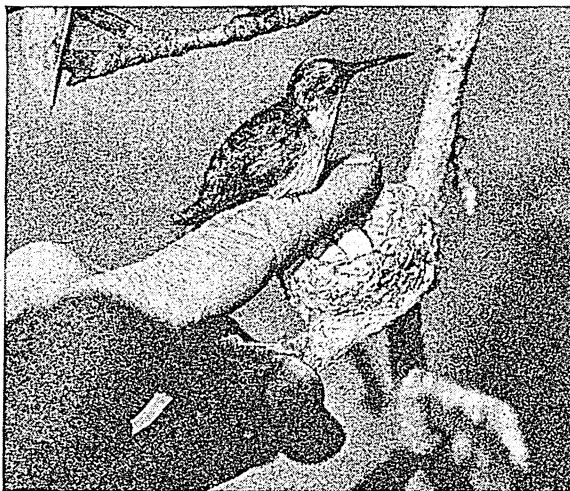
West of the great plains of the United States, a number of other species of humming-birds are found. Among them, California has the Anna's humming-bird, and one of the west-

ern species, the rufous humming-bird, is found as far north as Alaska.

Many of the species found in the tropical districts are even smaller and more remarkably clothed than the ruby-throat, for in addition to the brilliant metallic plumage, they have various feather adornments. Of these the most remarkable are the "double-crested," with its growth of amber-like feathers over each eye, and the "tufted-neck," with a wonderful red crest and long green-spotted tufts of red feathers extending from either shoulder.

The humming-bird family is known as the *Trochilidae*. Scientific name of ruby-throat, *Archilochus colubris*.

A FRIENDLY LITTLE HUMMER



The Humming-birds only do this kind of thing for people in whom they have the greatest confidence. If you are very careful and gentle with them and don't try to hurry matters, they'll sit on your finger just like that!

The Days of CRÉCY, POITIERS, and AGINCOURT

A War that Ravaged Europe for More than a Century—What It was All About—

The "Black Death" Pestilence that Stalked on Its Heels—

How Joan of Arc Drove Out the English

HUNDRED YEARS' WAR (1337-1453). On the side of a little hill near Crécy in northern France, an English army under King Edward III lay drawn up in three orderly divisions late one August day in 1346. On the plain below, outnumbering the English five to one, was a confused disorderly host of mounted French men-at-arms and hired Genoese crossbowmen on foot, under the French king, Philip VI.

Suddenly the Genoese advanced to the attack. But they were tired with a long day's march, and their crossbow strings were loosened by the wetting received in a terrific thunder-shower. Although they "shot fiercely with their crossbows," they were no match for the more rapid shooting of the English longbowmen, whose shafts "fell so thick that it seemed snow." When the Genoese saw the arrows falling thick among them they cast down their bows

and fled. At this King Philip flew into a rage and cried out, "Slay these rascals, for they will trouble us without reason!" Whereupon his men-at-arms dashed in among the Genoese and slew a great number of them.

"And ever still," says the chronicler Froissart, "the Englishmen shot where they saw the thickest press. The sharp arrows pierced the knights and their horses, and many fell, both horse and man. And when they were down they could not rise again, the press was so thick that one overthrew another."

In one place the French managed to reach a band of dismounted English knights commanded by the Black Prince, the 16-year-old son of Edward III. In haste a messenger was dispatched by the knights asking aid, but when their request was made known to the king, where he watched the battle from the

tower of a windmill, he inquired: "Is my son dead, or hurt, or felled to earth?" "No, sire," said the messenger, "but he is overmatched and has need of aid." "Then," replied the king, "return to them that sent you, and say to them that they send no more to me, so long as my son is alive; and also say to them that they suffer him this day to win his spurs, for I will

that this day's work be his, and the honor thereof."

As darkness fell the remnants of the French army were fleeing in confusion, but the English lines remained firm in their position on the hill. Thus the English army won at Crécy the first great land battle in the long Hundred Years' War with France.

The war had started in 1337, and it did not finally close until 1453. The causes of the conflict were to be found in the constant clashes growing out of the English holding of Guienne as a fief from the French crown; in the aid

given by the French to the Scots in their wars against the English; and finally in the interference of Philip of France and his vassal, the Count of Flanders, with the profitable wool trade of English merchants with the Flemish cities. In addition there was the claim that Edward III himself was rightfully king of France, because his mother was a sister of the late French king, while Philip VI was only a cousin; but the French assembly had decided that the throne of France could neither be inherited by a woman nor by one who claimed through a woman (miscalled the "Salic law").

The conflict was really a series of wars, truces, and peaces, lasting through the reigns of five English kings, from Edward III to Henry V, and of five French kings, from Philip VI to Charles VII. At the time of the battle of Crécy the English had already

THE TRIUMPH OF THE LONGBOW AT CRÉCY



This picture, from an old print, shows clearly one of the deciding features of the Battle of Crécy, in which the French, although outnumbering the English five to one, were so woefully defeated. With their powerful longbows the English archers not only outmatched the crossbowmen of the French but overwhelmed each onslaught of the enemy cavalry before they could come to close quarters.

won command of the English Channel by a spectacular naval victory at Sluys; and after Crécy, the town of Calais, the door into France, surrendered to them on Sept. 28, 1347, after a year's siege.

For almost ten years after that the fighting lagged due in part to a great pestilence, called the "Black Death," which swept over Europe, carrying off more than a third of the population (*see* Black Death).

Not until 1355 was the struggle between the two countries renewed. The English now carried the conflict into southern France, instead of confining it to the northern section as before. At Poitiers (1356) the Black Prince with a small army of Englishmen was confronted by an overwhelming French force. In vain the Prince offered to surrender his spoils and his prisoners and to promise not to fight for seven years if he might be allowed a safe retreat. This offer was rejected, so certain did the French feel of victory.

The Longbows Win the Day at Poitiers

The Black Prince arranged his troops on a little plateau protected at the flanks by a hedge and by rough and marshy ground. The brave but inefficient French King John threw away his advantage of superior numbers by ordering his knights, weighted down with their armor, to dismount and advance on foot against the hail of English arrows. "There was a sore fight that day," says the chronicler, "and many a great stroke given and received." One after another the three divisions of the French army were thrown into confusion. King John and his youngest son, refusing to flee, were taken captive by the English. Again the victory was due to the new English weapon—the "longbow," with its "cloth-yard shaft" and to the trained skill of the English archers.

The horrors of a peasants' revolt and civil strife were now added to the miseries of France. A treaty with England was finally concluded at Bretigny in 1360, by which King John was to pay a large money ransom, and Edward III was to have Guienne, Crécy, and Calais in full sovereignty. In return Edward III renounced all claim to the French crown.

But in 1369 the new king of France, Charles V, physically weak but intellectually strong, found an excuse for breaking the treaty and renewing the war. Aided by the able Breton general, Bertrand du Guesclin, he organized an army of professional soldiers instead of the medieval knights, and by cautious maneuvering brought one place after another into his hands. Only Calais in the north and Bordeaux in the south remained to the English at the time of Charles' death in 1380.

Victory of the English at Agincourt

For nearly a generation the war then languished, due to factional strife for power in both England and France. Soon after the accession of Henry V, the hero king of England, it began again. At Agincourt, near Crécy, a small English force was again confronted in 1415 by a large French army. The French, it seemed, had learned nothing from the

disasters of Crécy and Poitiers, or from the exploits of Charles V and Du Guesclin. As in the two former great battles, their forces consisted chiefly of dismounted knights weighted down with heavy armor. And again they were packed close together, in a narrow newly-plowed field between two woods, in which they sank almost to their knees. Shakespeare makes Henry V say, the night before the battle, that he "wished not for a single man more" to share the glory. A third great English victory, equal to those of Crécy and Poitiers, was the result.

By the Treaty of Troyes (1420) the defeated and disunited French agreed that Henry V should marry Princess Katherine, the daughter of Charles VI of France; that during the life of this insane king, Henry should act as regent; and after Charles' death Henry should reign as king of France as well as England.

Henry V did not live to wear the French crown for he died seven weeks before Charles passed away (1422). The death of these two monarchs left the claim to both thrones to Henry VI, the nine-months-old son of Henry V and Queen Katherine.

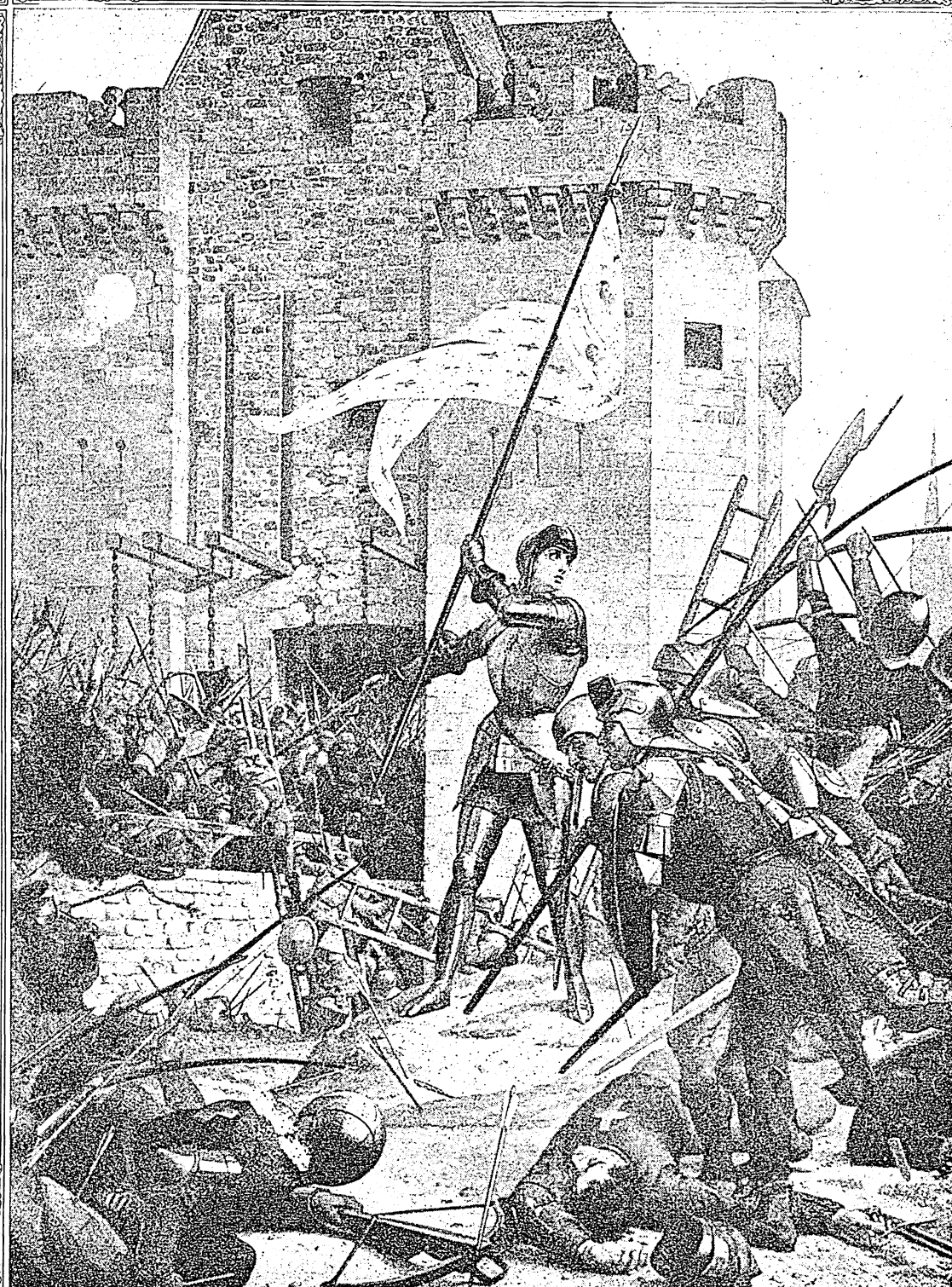
The English claims in France, however, were disputed by the disinherited dauphin of France, later Charles VII, who refused to accept the Treaty of Troyes. For a time he was too weak to be feared and at the end of seven years it seemed that Orleans, his last considerable stronghold, would surely fall to the English.

The Wonderful Maid of Orleans

Just at this darkest moment in the fortunes of France, a new force appeared in the person of Joan of Arc, the Maid of Orleans (*see* Joan of Arc). Inspired by her patriotism the French forced the English to raise the siege of Orleans. Victory followed victory in rapid succession, until finally Joan led the dauphin through a hostile country to be crowned at Reims as King Charles VII. Even after Joan's capture and execution by the English and Burgundians her spirit seemed to inspire the French and to wake in them a new national sentiment. Little by little they drove the English back. Finally the war ended in 1453 with only Calais remaining in English hands.

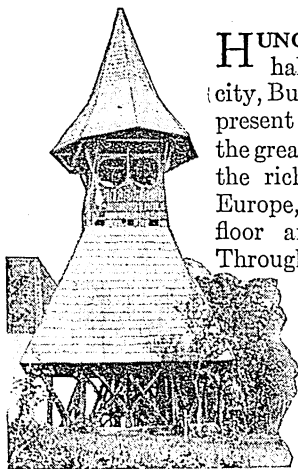
Instead of winning the French throne for the English king, the Hundred Years' War had lost for him the last of those continental possessions which had once been held by Henry II. The French king no longer numbered a powerful rival monarch among his vassals, and soon established an almost absolute power in his kingdom. He enjoyed a permanent revenue and was supported by a standing army equipped with modern artillery—for cannon had come into use either at or since the battle of Crécy. In addition the hundred years' conflict to expel the foreigner from their soil had developed in French bosoms the root of that intense patriotism which today characterizes France. But against these gains for France must be balanced fearful losses inflicted upon its land and people, the check to population and the brutalization of long-continued warfare.

HOW THE MAIDEN WARRIOR SAVED ORLEANS



"Onward—forward—swords against the foe! On and on the lily banners go!" This stirring painting by Lenepveu depicts the scene which marked the turning point of the Hundred Years' War. Joan of Arc, holding high her white banner embroidered with the lilies of France, is leading the men of Orleans against the English, who were in possession of the forts that commanded the city of Orleans. Joan's standard was looked upon as an omen of victory. "When it touches the walls," she had said, "we shall surely enter." And so it was. The English were driven from the forts, and Orleans was again free, after a seven months' siege.

The BROAD HUNGARIAN PLAIN and Its Picturesque People



This is one of the little bell towers you will see in the villages all over Hungary.

HUNGARY (*hūn'gā-ry*). Within half an hour of its capital city, Budapest, lies the heart of the present kingdom of Hungary—the great *Alföld* ("lowland plain"), the richest agricultural land of Europe, as level as a threshing-floor and of amazing fertility.

Through its fertile expanse flow the broad winding Danube and its marsh-fringed, sluggish tributary, the Theiss, or Tizra. Cornfields that stretch uninterrupted as far as the eye can reach give way to vaster fields, where peasants in the garments that Asia wore

before the Christian era are feeding countless stacks of wheat to modern threshing-machines.

It is a peaceful land of broad meadows, strips of clover, huge windmills moving surely but leisurely, like the Magyar himself; of vineyards, long stretches of bright red peppers from which paprika is made, and purple alfalfa fields; of huge rectangles planted with tobacco, cabbage, potatoes, or sugar-beets. The landscape is everywhere dotted with splotches of red and blue—the full bulging skirts and kerchiefs of the peasant tillers of the plain. Stubble-fields, gorgeous with poppies and sunflowers, contrast vividly with occasional patches of fallow land or pasture, where "Little Boy Blue" is tending a flock of snow-white geese. High well-sweeps are always in sight.

Splendid asphalt roads, shaded by long rows of Lombardy poplars, lead off in every direction—past one village after another of whitewashed walls, red-tiled or straw-thatched roofs, church spires, and often the graceful stony finger of a mosque, to remind one of 150 years of Turkish rule over Hungary (1526–1683). The long narrow peasant houses look out on the street over little gardens of old-fashioned flowers, walled in with whitewashed sun-dried brick.

Farm Life a Fine Art among the Magyars

In his home the "Magyar" (as the true Hungarian calls himself) has reached a high stage of peasant culture. When he can afford a floor of wood he has it, even in the kitchen; when he must put up with an earthen floor, it is compact, hard, and wonderfully clean. In his kitchen, as clean and orderly as his front room, his wife cooks in a pot which hangs from a crane over an open fireplace, or on an earthen or tile stove with a tiled chimney. His passion for china and earthenware, dishes and bowls, and the pitchers and mugs with which he loves to line one or more of the walls of his house, is only exceeded by his

love of flowers. He refuses to live without flowers and fruits and trees.

The Magyar's conception of a completely furnished house goes beyond mere furniture in sufficient quantity. His furniture must be decorated, his chairs and benches painted, his great chests carved. The walls are tinted, as are the great beams and boards of the ceiling. He even decorates his veranda, and always the gable ends of the house, with tasteful designs in carving or bright paints. The outside walls of the house are always white and clean. His pigpens, corn cribs, stables, and barns are substantial and often decorated in colors. The yard about the house is clean and orderly, either graveled or covered with compact turf. His fields are not disfigured with either fences or weeds.

Vast estates belonging to the church and nobility until recently occupied a large part of the *Alföld*; 77 per cent of the peasants owned no land at all. With the change of government after the World War of 1914-18 most of the estates were broken up into small holdings.

The Hungarian Steppes and the Cowboys

Between the *Alföld* and the vineyard-clad foothills lies the *pusta*, or steppes of Hungary, which resembles the *Alföld* as it was before the days of agriculture. Treeless save for small clumps of locusts near the widely separated peasant homes, it is the range-land of thousands of big-boned long-horned Hungarian cattle and flocks of sheep, patiently tended by tall fellows in sheepskin greatcoats and cowhide sandals, who lean on their crooks and seem always intent on some far-away world, while they puff lazily at their long pipes. Here, too, are seen many camps of the *Tziganes* (*tsig'ā-niz*) or gipsies. About their queer tents naked children roll in the grass, gaily-clad men stroll about, and brightly decked women tend the fat wild turkey or young pig roasting over the fire. This carefree life is passing, for in 1918 the government ordered the gipsies to settle in fixed abodes, abandoning their nomadic habits.

The Magyar is a little shorter in stature than the average American, strong and healthy. His appreciation of the beautiful, so evident in his architecture, his innate orderliness and cleanliness, his passion for flowers and music, is second only to his love of his land and his absolute independence of spirit and self-confidence. He is generous to a fault and extravagant, but hard-working. He does not like trade, and less than a tenth of the population is so engaged. The Magyar language is intimately related to that of the Finns, Lapps, and Ostiaks of Asia, and bears little relation to the other languages of Europe except the Turkish. Although our alphabet is used, no word on a Magyar printed page gives us any hint as to its meaning, since the language has practically no

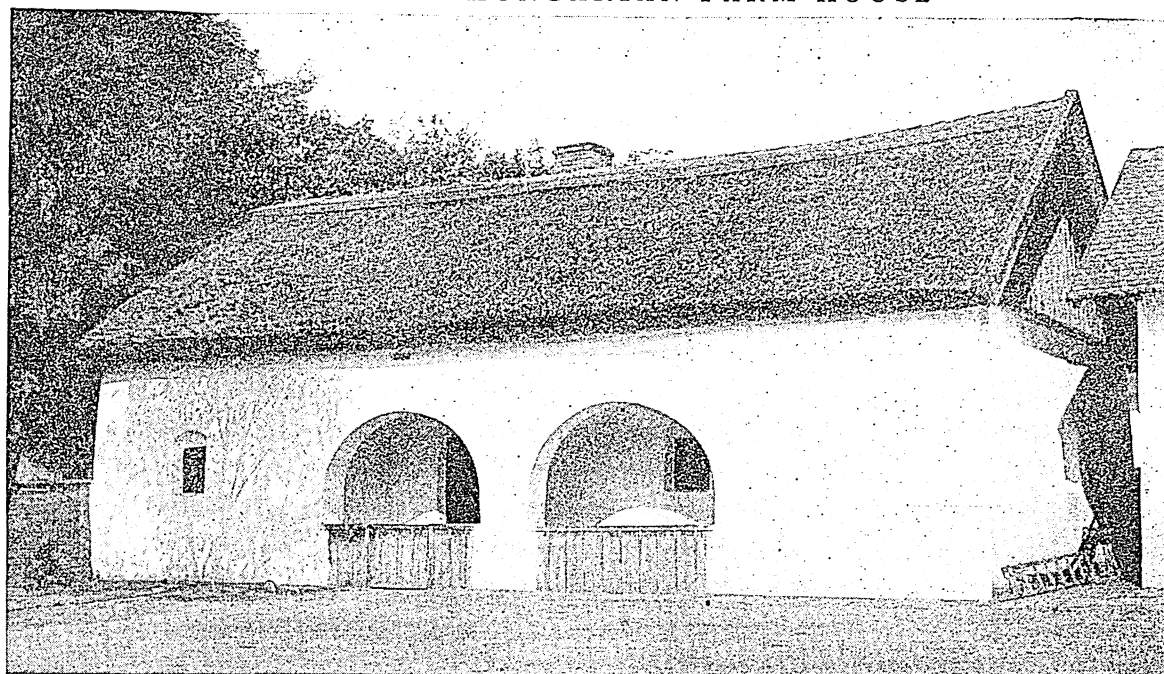
Latin or Teutonic roots. This makes the very extensive literature written in the Hungarian language a sealed book to most Europeans and Americans.

The Great and Beautiful City of Budapest

Budapest, the seat of government, with a population of over a million, is beautifully situated on both sides of the Danube (*see* Budapest). Other large cities are Szegedin (or Szeged), Debreczen, and Kecskemet. More than 5,000 miles of railroad, most of it operated by the government, connect the leading cities with one another and with the outside world. The

year 1000 their king, known in history as St. Stephen, accepted Christianity and a crown from the Pope. In the 15th century John Hunyady, the great national hero of Hungary, defended the land as regent against the oncoming floods of Turkish conquest, until his death by plague a few days after his successful relief of Belgrade from Turkish siege (1456). On the fatal field of Mohács (Aug. 29, 1526) the last of the Angevin line of Hungary's kings perished, with 20,000 of his men, and the horsetail standards of Sultan Solymán the Magnificent were soon spread over almost the

A TYPICAL HUNGARIAN FARM HOUSE



We are looking through the arched openings of the porch of a Magyar house of the better sort. How white and clean the walls look, and how neat the yard! The pigpens, corn cribs, stables, and walls are all of the same substantial build.

Danube is a great avenue of commerce. Hungary exports chiefly agricultural products—wheat (its main crop), wheat flour, corn, rye, clover seed, potatoes, beans, and peas; cattle, swine, and horses; meats and dressed poultry and eggs, butter, and lard. For the most part these products go to Central European nations which are neighbors of Hungary. Among its important manufactures are iron and steel, machinery, textiles, sugar, wine, and malt. Its mineral deposits include iron ore, coal, and bauxite. Its deposits of bauxite, the aluminum ore, are among the largest in the world. Hungary's main imports are machinery, metals, coal, textiles, paper, and timber.

The Magyars, a Finno-Ugric race, first came as nomadic raiders from Asia, up the valley of the Danube, as early as the 9th century. After their defeat by the Germans at the Lechfeld (in Bavaria) in 955, they settled down as permanent residents—an island of Asia in the heart of the Slavic East of Europe—in the broad valley of the Theiss. In the

whole of the land. Over the small remnant of non-Turkish Hungary, the Hapsburg Ferdinand of Austria (brother of Emperor Charles V) was chosen to rule. It was not until 1718 that his successors completed the redemption of Hungary from Turkish rule.

Origin of the Dual Monarchy

Restiveness under the sway of the Austrian Hapsburgs led Hungary in the course of the ill-fated Revolution of 1848 to establish a short-lived republic, with Louis Kossuth as president. When this was put down, Austria was obliged (1867) to grant Hungary equal partnership in what was thenceforth known as the "Dual Monarchy" of Austria-Hungary.

After the defeat of the Dual Monarchy in the World War of 1914-18, Hungary was made a separate state by the Treaty of Trianon. Its area of 35,900 square miles was less than one-third that of old Hungary (*see* Austria-Hungary). The new Hungary (native name *Magyaria*) extended from the river Drava on the south to the Danube on the north, and from the Bratislava

district on the west to the mountain walls of Transylvania. Thus, by the treaty, Hungary had lost Transylvania to Rumania, the Slovak strip along the Carpathians to Czechoslovakia, and the Slavonia-Slovene-Croatian land to Yugoslavia. These losses stripped Hungary of some 10,000,000 of its population, about one-third of them being pure Magyars.

The new Hungary began as a republic. After an interval of soviet rule under Bela Kun in 1919, monarchical government was restored. Since the Allies refused to allow a Hapsburg on the throne, Admiral Nicholas Horthy ruled as regent.

By submitting to German domination, Hungary enlisted the support of its powerful neighbor to regain some of the territories it had lost. In the partition of Czechoslovakia in 1938 and 1939, Hungary won rich lands (see Czechoslovakia). In 1940 it acquired, through German and Italian arbitration, the northern half of Transylvania from Rumania. Then, in 1941, on the heels of a German army of invasion, it seized territory in northern Yugoslavia. It then occupied an area of about 72,500 square miles, and had a population of about 14,000,000.

HUNS. A writer of the early Middle Ages pictured the savage wandering Huns of his time as "men little in size, but quick and active. They live largely on half-raw animal flesh, which they merely warm by placing it between their own thighs and the backs of their horses. On horseback every man of the nation lives day and night. On horseback he takes his meat and drink, and when night comes he leans forward on the neck of his horse and there falls asleep." The terrible Huns often lived up to the reputation this writer gave them.

In 374 A.D. the Huns crossed the Volga River and entered Europe for the first time from their homes in Central Asia. They conquered the Ostrogoths, and driving the Visigoths across the Danube occupied the region north and west of the Black Sea. There they lived for more than 70 years, before they began their second and greater wave of invasion. In 451, under Attila, the "Scourge of God," they swept into Germany and crossed the Rhine into what is now France, laying waste the country with fire and sword. In a bloody battle near Chalons he was defeated by a combined army of Romans and Visigoths under Aëtius and forced to retreat. The next year the Huns descended into Italy, devastating the country.

They would probably have taken Rome, as Alaric had done 40 years before, had it not been for the bravery of Pope Leo I, who in an interview so overawed the fiery Hun that he spared the city and withdrew from Italy. With the death of Attila in 453 the empire of the Huns, which included all the peoples from the Volga to the river Rhine, quickly

DO YOU WONDER PEOPLE FLED IN HORROR?



"Nations fled in horror from those frightful faces, if indeed I may call them faces; for they were nothing but shapeless black pieces of flesh with little points instead of eyes." Such were the Huns, as the medieval chronicler depicts them, and the hair of those fierce mustaches was all the hair that was allowed to grow on their faces, for, says this quaint old writer, hot irons applied to the faces of the baby boys burned out the hair on cheek and chin before ever they were allowed to taste their mother's milk.

fell to pieces. The remnants of Attila's following either went back to Asia or mingled with the peoples they had subdued. Their great leader lived on in German legend as Etzel in the 'Nibelungenlied'. The Magyars, who several centuries later settled what is now Hungary, were related to the Huns.

HURON, LAKE. The next to the largest of the Great Lakes, Huron has an area of 23,010 square miles, including Georgian Bay. Its greatest length is 206 miles, and its width 183 miles. Its shape is so irregular that a line from the head of Saginaw Bay to the far shore of Georgian Bay is nearly as long as the lake itself. Its level and its depth are about the same as those of Lake Michigan, with which it connects through the Straits of Mackinac, its surface being 580 feet above and its bottom 121 feet below sea level. Its greatest depth is 750 feet. In spite of the mountainous billows that the northeasters drive upon its western shore and which make Saginaw Bay the dread of mariners at the end of the season, Lake Huron is a great highway of traffic. Its own ports are of secondary importance, however.

The most beautiful scenery of all the Great Lakes is in Georgian Bay, a great arm of Huron, 120 miles long and 50 miles wide, separated from it to the north and east by the long island of Manitoulin. A trip through the North Channel, between Manitoulin and the rocky bluffs of the Ontario mainland, and on among the "Thirty Thousand Islands" that strew the northern half of the bay is one of the most picturesque water voyages in North America. Georgian Bay is becoming one of the most popular vacation spots of the continent, and hundreds of cottages and hotels have been built on its islands within the last few years.

The Trent Canal, between the southeast end of Georgian Bay and the Bay of Quinte, near the eastern end of Lake Ontario, is designed to provide a shorter water route for shippers between the St. Lawrence River and the Lake Superior-Lake Michigan region. As it permits a draft of only six to eight feet, it is too shallow for vessels of any size. (See Canals.)

Through the St. Clair River, Lake St. Clair, and the Detroit River, the waters of Lake Huron flow into Lake Erie. The passage between the lakes is continually dredged; a channel of fixed depth is kept open.

HUSS, JOHN (about 1369-1415). "I am prepared to die in the truth of the Gospel which I taught and wrote." Like Wyclif of England a generation before, and like Martin Luther of Germany who was to lead the great Protestant Reformation a century later, John Huss, the Bohemian religious reformer, defied the authority of the Church and was ready to defend his principles to the uttermost. In his case the uttermost was demanded, and for his views he was burned at the stake as a heretic.

Huss was born of humble parents in the little Bohemian village of Husinec. He was christened Jan or John, and from his birthplace was called John of Husinec, or, in shortened form, John Huss. Having decided to become a priest he entered the University of Prague and after his graduation became a lecturer there on philosophy. For a time he was a rector of the university. He also took a prominent part in the nationalist Bohemian protest against the undue influence of Germans in the university, which in 1409 led the German masters and scholars to secede and found the rival University of Leipzig.

As a preacher Huss won the hearts of the people by his powerful sermons in the Czech (Bohemian) tongue, as well as by the purity and nobility of his life. His attacks on evil living among the clergy, although in this he was supported by the archbishop of Prague, won him much enmity.

Huss had early come under the influence of the religious and philosophical writings of John Wyclif, which had gained a strong hold in Bohemia. These were written in Latin, which was then the universal

language of scholars, and so were as easily read by one land as another. Huss adopted many of the philosophical and religious teachings of Wyclif; he did not follow him, however, in the rejection of the doctrine of transubstantiation, but held to the orthodox belief.

Nevertheless when Huss opposed the burning of Wyclif's books, he was charged with heresy and forbidden to preach or to teach.

The struggle was complicated by the fact that this was the time of the Great Schism in the Church, when there were three rival claimants to be pope. The climax came when Huss attacked the granting of indulgences in Bohemia by one of the three claimants for aid against his enemies, and the pope's bull was burned by his followers amid much disorder. Huss was now excommunicated, and for two years went into retirement. He used the interval for

writing defenses of his views, and incidentally he became one of the founders of the Bohemian tongue as a literary language.

When the Council of Constance met in 1415 to heal the Great Schism and consider the question of reforms in the Church, Huss attended it under a safe-conduct from the Emperor Sigismund to justify his views. On his arrival he was arrested as an excommunicated heretic and thrown into prison. His condemnation was a foregone conclusion. When he steadfastly refused to recant his teachings, unless shown that they were in conflict with the Scriptures, he was condemned to death. As the sentence was passed he gazed steadfastly at Sigismund, who had the grace to blush with shame at the thought of his violated safe-conduct.

Huss met his death (July 6, 1415) with heroic constancy, as also did his disciple Jerome of Prague, a year later. "Thinking to extinguish heresy," says an English historian, "the Council of Constance had made it the national faith of Bohemia, and had made the martyr Huss the national hero and the national saint." The immediate result was the terrible Hussite War, a struggle on the part of the Bohemians for national, religious, and social revolution, in which they resisted the combined force of Europe in numerous "crusades" and for nearly a score of years prevented Sigismund from securing his inheritance of the Bohemian crown.

HUXLEY, THOMAS HENRY (1825-1895). Rugged honesty, blithe courage, and unaffected humanness were the outstanding qualities of this great biologist who for more than 40 years was the foremost British champion of the new scientific doctrine of evolution. Educated as a physician, Huxley on graduation obtained an appointment as surgeon in the British navy. Among the many valuable studies of sea creatures that he made during a voyage to Torres Straits (1846-1847) was one 'On the Anatomy and Affinities of the Family of Medusae', which was to

JOHN HUSS



"I am prepared to die," he said, "in the truth of the gospel which I taught."

furnish a most important link in the theory of evolution. This was before the publication of Darwin's 'Origin of Species', but Huxley here gave the first hint of the now widely accepted theory that the growth of a highly developed creature from embryo to adult is a hurried retelling of the story of the evolution of that species.

Darwin said that Huxley was one of the three men in England whom he needed to convince of the theory of evolution in order to satisfy himself. So thorough and earnest a convert did Huxley become that his popular lectures and writings in defense of Darwin's theory have somewhat obscured his own original work in biology and zoölogy.

From 1854 to 1885 he was professor of natural history in the Royal School of Mines, London, being the first great teacher of biology by the laboratory method. Toward the end of his life he gave much time to public work in general education, to improving legislation concerning the fisheries, and the like, for he believed, in his own words, that he was "a man and a citizen before he was a philosopher."

Among Huxley's best-known writings are: 'Evidences as to Man's Place in Nature' (1863); 'Lay Sermons, Essays, and Reviews' (1872); 'The Crayfish: An Introduction to the Study of Zoölogy' (1880); 'Scientific Memoirs' (4 vols., 1898-1902).

HWANG RIVER. Winding through the mountains and over the fertile plains of northern China flows the great and terrible Hwang Ho ("Yellow River"), the "Sorrow of China." In its keeping are the lives and the fortunes of millions of people, and like a capricious giant it deals out death or wealth by turns. For thousands of years, since the earliest dawn of Chinese history, the people have struggled with this giant, trying to curb his strength, and today they are no nearer conquering it than ever.

Through the first two-thirds of its course the river, which is the second in size in China, flows through mountains, falling rapidly. The soil of these mountains is a yellow earth which dissolves easily and is washed down in enormous quantities by the river, staining its waters the deep yellow from which it, and the Yellow Sea, get their names. But as the river leaves the mountains and starts across the flat plains it begins to deposit this sediment. By degrees the bed rises and the people build embankments to prevent the river from overflowing. As the bed rises the embankments must be raised too, until the stream is flowing many feet above the level of the surrounding country. As time goes on the situation becomes more and more dangerous; finally a breach occurs and the whole river pours over the country, carrying destruction and ruin with it. If the breach cannot be repaired the river leaves its old channel entirely, and finds a new exit to the sea along the line of least resistance. Many times it has thus changed its course, entering the sea through different mouths as much as 500 miles apart.

In 1851 the river made such a change, and since then it has flowed to the north instead of to the south

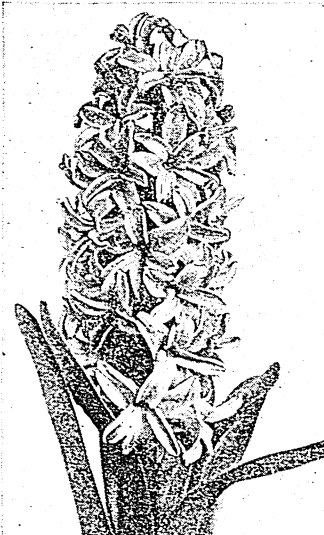
of the rocky peninsula of Shantung. It took 15 years to repair the damage, and even then many changes remained. The southern valley from a well-watered fertile plain was left practically without water. The northern valley was also injured because the river deposited three feet of sand and mud over the fields. Later the northern valley gained greatly in fertility because of the new water supply. In 1887 another flood occurred which swept away whole villages, killing more than a million people and flooding 50,000 square miles of territory.

The Hwang Ho rises in the mountains of Tibet, not far from the headwaters of the Yangtse Kiang. It makes first a great sweep to northward, and then, having struck a high mountain range, turns due south for 500 miles. It then turns eastward towards the sea. Although it is the second river in China, it is too shallow in winter, and too swift in summer, to be navigable. Its total length is about 2,700 miles.

HYACINTH. The ancient Greeks told this story of the origin of the beautiful and fragrant hyacinth. One day, said they, the god Apollo was playing a

game of quoits with a young mortal, Hyacinthus, whom he dearly loved, when Zephyrus, the god of the west wind, passed by. Being jealous of Apollo the west wind blew the latter's quoit aside, and caused it to strike poor Hyacinthus, inflicting a mortal wound. In a few moments Hyacinthus died in Apollo's arms. In his memory the grieving Apollo then caused these beautiful clustered blossoms to spring from the fallen drops of the youth's blood.

A GARDEN BEAUTY



The hyacinth, a striking garden favorite, blooms in early spring. The many blossoms, clustered about a single spike, may be white, pink, blue, or scarlet.

At all events we know that the wild hyacinth was originally found in Greece and Asia Minor. It was by comparison an insignificant plant. Brought to western Europe in the 16th century, the hyacinth was extensively cultivated by Dutch horticulturists. They succeeded so well that the original blue and purple blossoms were varied to numerous shades of pink, rose, yellow, scarlet, and pure white, so that today we have a splendid selection from which to choose. The best bulbs are still grown in Holland, where gardening is a national industry.

The hyacinth proper belongs to the lily family. The water hyacinth (*Eichornia speciosa*), which occurs in American tropical and sub-tropical regions, is a

member of a different family, *Pontederiaceae*. It grows in such profusion and spreads so rapidly that many rivers in the southern part of the United States are choked with the plants and water traffic seriously impeded. Various methods have been tried of eradicating it. Army engineers send out boats to cut out the jam of hyacinths as soon as it forms and the tangled mass is pushed into the current to be carried away. Experiments are being made with a parasite which attacks the leaves from beneath and in time kills them. Although it is almost without food value, cattle seem very fond of it and have been in some instances lured to death in efforts to obtain it.

Scientific name of garden hyacinth, *Hyacinthus orientalis*. Flowers small, bell-shaped tubes with 6 recurved segments; borne in a crowded raceme on a stout scape; stamens 6 in number. Leaves narrow, erect from the base and 8 to 12 inches long. Bulb produces long fibrous roots.

HYDERABAD. In the center of the peninsula of India, between the provinces of Bombay and Madras, lies Hyderabad, the largest and most important of the states, with an area of 82,698 square miles, and a population of about 14,400,000. Its ruler is the "Nizam," whose wealth and power surpass that of all the other princes of the Indian Empire. In the 17th century Hyderabad was a province of the Mogul Empire whose capital was at Delhi; but with the decline of that power in the 18th century the Nizam became independent. The ruler and the government officials are still Mohammedans, although the people are chiefly Hindus. In the great Indian Mutiny of 1857 the Nizam remained loyal to the British, and his successor was one of the most active Indian princes on the Allies' side in the World War of 1914-1918.

Hyderabad is a plateau about 1,200 feet above sea level. It is rich agriculturally and has great mineral wealth, especially coal. Irrigation, railroads, and manufactures have brought great prosperity to its rulers. The products include millet, rice, wheat, oil-seeds, cotton, tobacco, sugar cane, wild silk (*tussur*), lac, gums, and oils.

But of greater interest to visitors are the relics of India's historic past which abound in this region. Chief among these are the marvelous temples at Ellora and at Ajanta in the northwestern corner of the Nizam's dominions. Most of these consist of caves carved out of the rock and decorated with weirdly beautiful designs and figures made at the cost of enormous labor. The Kailas at Ellora is looked upon as one of the wonders of the world, for not only was its interior hewn out into great chambers and altars and bas-reliefs, but the outside of the rock-bound hill which formed its roof was chipped off bit by bit and fashioned delicately into an exterior of graceful and intricate design. As it stands today, the temple looks as if it had been built up stone by stone, until a closer inspection shows that its walls and colonnades, its obelisks and the thousands of mythological figures grouped

about it are all part of one great carved rock.

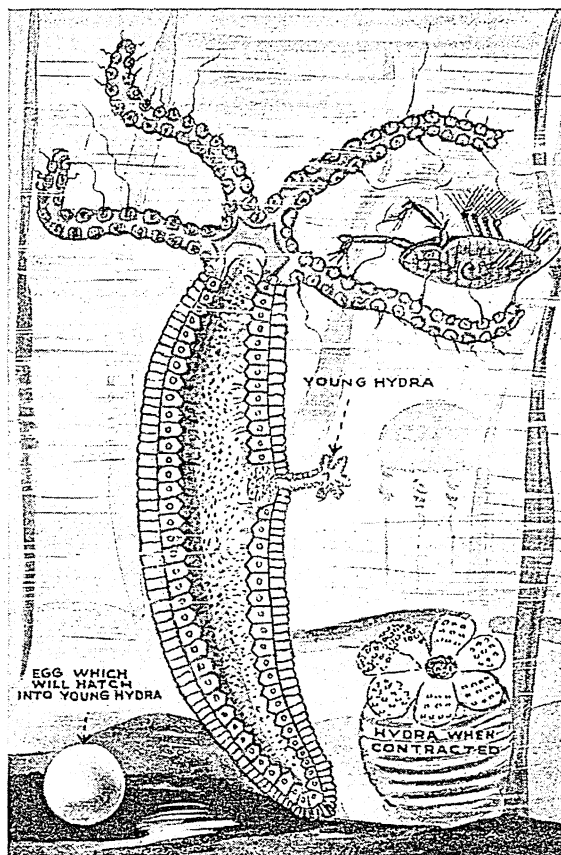
The city of Hyderabad, capital of the Nizam's state, is the fourth largest city in India (population, about 470,000). In the Sind region of northwestern India is a city likewise called Hyderabad, but it is of lesser importance.

HYDRA. Gather in a bottle some of the floating green weeds or submerged plants or stones from a stagnant pond and empty them into a glass bowl filled with clean pond water. You may then find attached to the plants the tiny fresh-water creatures we call "hydra." But you must become a scientist for five minutes, in order to enjoy and appreciate these small, lowly, and inconspicuous but very interesting members of the animal kingdom.

Hydra a monster? Yes, to the many small animals it preys on; and it does resemble the many-headed Hydra monster of Greek mythology (see Hercules) for which it was named.

Picture it thus: about the size and shape of the pointed half of a common pin; the larger end sticky, to attach it to any objects in the quiet fresh water of ponds and streams where it lives; in the free end the mouth, capable of opening wide, and

THE HYDRA CAPTURES A MEAL



This picture shows a hydra very much enlarged and cut in two from top to bottom so you can see how it is made inside. Two of its tentacles are engaged in capturing a crustacean. Despite its relatively large size, the crustacean cannot even resist, for those tiny threadlike darts which the hydra shoots out bear a

surrounded by a circle of threadlike tentacles. Stinging cells in the tentacles poison and paralyze tiny crustaceans, worms, and other small creatures which touch them. Then the tentacles sweep the prey into the hydra's mouth.

The hydra is among the oldest and simplest of the animals which have different kinds of cells (see Cell). It is closely related to the jelly-fishes, sea anemones, and corals, which have bodies built on the same plan. The body structure is simple, but contains the essential elements of the more complex forms of animal life. It has two layers of cells—an outer layer for protection and an inner one to perform the digestive operations. The bases of the cells are drawn out into long muscle fibers; in the way these fibers act we see them as the forerunners of our own muscular system. A network of nerve cells extends throughout the animal. This transmits nervous impulses picked up by the sensory cells to the muscle cells, which contract, or to the gland cells, which secrete.

Young hydras develop from buds on the sides of older ones, and also from eggs. If a hydra is injured, its lost parts are quickly restored, or "regenerated." If it is cut into a dozen pieces, each piece will soon form a complete hydra.

The few species of hydra, mostly world-wide but seldom abundant, are almost the only fresh-water representatives of their great branch of the animal kingdom (the *Coelenterata*). That is one reason why the biologist prizes them so highly. The name hydra comes from the Greek *hydor*, meaning "water." Two of the more common species of hydra are the brownish *Hydra oligactis*, and the green *Hydra viridissima*.

HYDRANGEA. "Won't you walk into my flowers?" says the hydrangea to the pollen-bearing insects, flaunting her showy outer cluster of sterile flowers which have neither stamens nor pistils and serve only to attract her six-footed visitors in the direction of the small bashful fertile flowers inside.

The hydrangea plays a conspicuous part in the flower pageant of our late summer and autumn gardens. It is a large ornamental shrub with a big globular head of flowers, usually pink, but sometimes bluish or white. There are more than 25 kinds of these hardy shrubs, found chiefly in North and South America, China, Japan, and in the mountains of India. Perhaps the kinds we know the best are those grown as showy borders for our gardens, sometimes eight to ten feet high. We are familiar, too, with the dwarf variety grown in pots that we see particularly

at Easter. This variety can be grown out of doors, but it must be stored during the winter.

The hydrangea's name comes from the Greek *hydor*, "water," and *angeion*, "pail." It belongs to the *Saxifrage* family. The large oval strongly veined leaves grow in opposite pairs along the stem. Scientific name of common dwarf variety, *Hydrangea hortensia ataska*.

HYDRAULIC MACHINERY. Click-chug! Click-chug! Click-chug! In the green stillness of the wilderness the staccato beat of unseen machinery, quivering the leaves to its rhythm, is a strangely foreign sound. Presently we come upon the source—a little hydraulic ram less than two feet high industriously pumping water to some unseen cottage on the heights above.

Let us see how it works. From a spring basin some 12 feet above the ram, an iron supply pipe brings the water to the ram at our feet. At first the water flows out through a waste valve and is carried off; but presently the increasing force of the water pushing up against the valve closes it, and it clicks shut. The column of water is instantly arrested, just as when we close a faucet. The recoil hurls the water against an inner valve, opens it, and as the water rushes in, the air in the rounded chamber above is compressed. With the recoil of the water the pressure on the waste valve is lessened, the valve drops open, again provid-

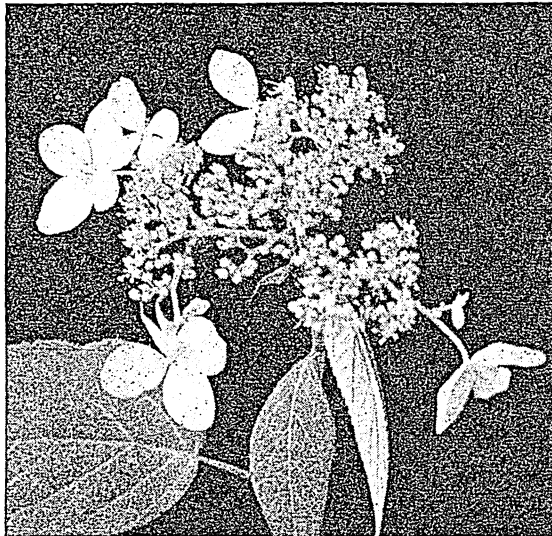
ing an outlet for the water, which now turns in that direction. The compressed air cushion in the air chamber expands, closing the valve to the supply pipe, and forcing the water through a delivery pipe high to the house on the hill. The waste valve is again closed by the rush of water, and the hammer-like blow comes again at the air-chamber valve. As the process is repeated, over and over, the water is pumped steadily to a height much greater than its source, with no other force than the energy developed by the fall of the water itself. With a plentiful flow of water and a fall of from 1½ to 10 feet,

a water supply can be lifted as much as 250 feet by means of the ram mechanism.

The recoil of the water can also be made to drive the sliding piston of a pump attached to the body of the ram, the piston lifting and pumping water through ordinary pump valves. With this arrangement a ram working with muddy water may be used to raise clear spring water.

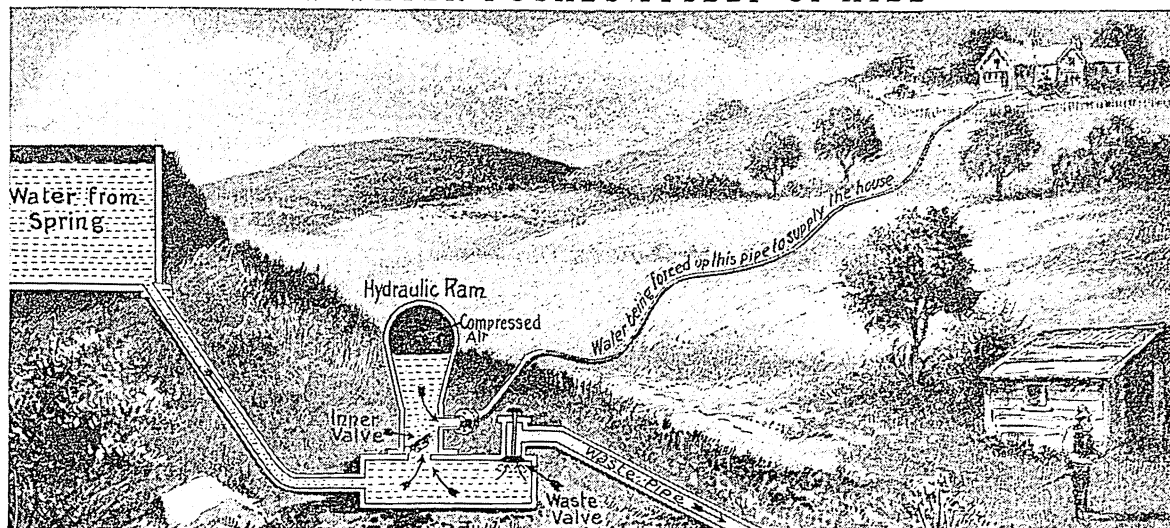
The hydraulic ram is only one of many machines operated with water power. These machines are possible because liquids are, for all practical pur-

THE BEAUTIFUL HYDRANGEA



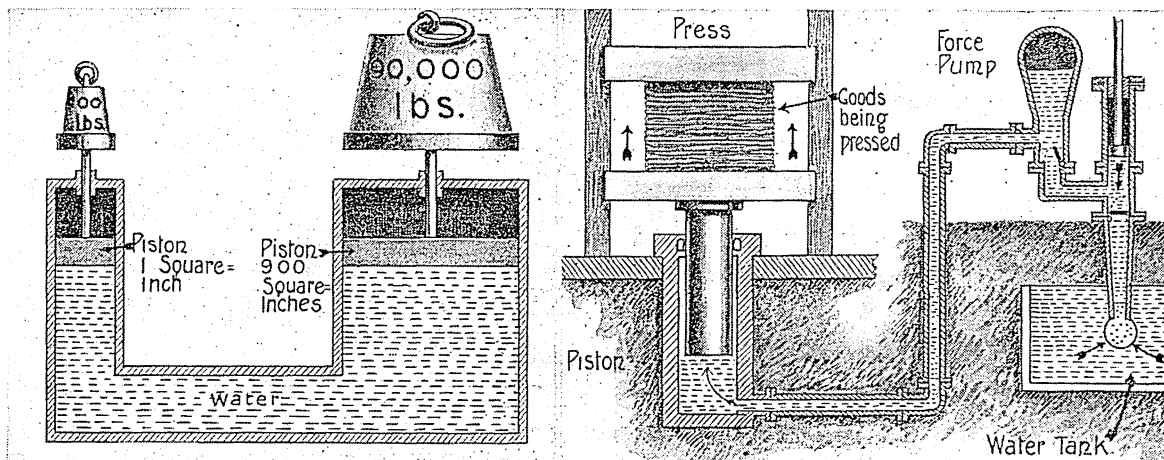
Those big gorgeous blossoms conceal the true flowers inside them. They are the show-windows, so to speak, which attract the insect shoppers.

HOW WATER PUSHES ITSELF UP HILL

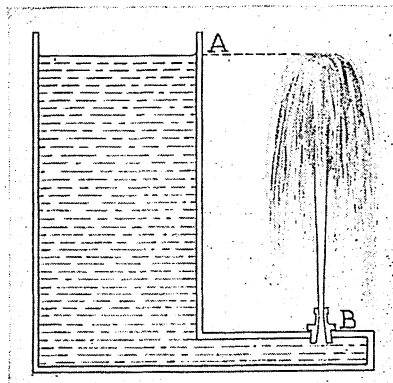


Here you see how a hydraulic ram forces water to "run up hill." From the spring reservoir, the current first passes down through the lower part of the ram and out the waste pipe, until it gains sufficient speed to close the waste valve. This checks its course suddenly, and its momentum carries it up through the inner valve, greatly compressing the air in the air chamber. Once the water loses its momentum, the compressed air forces it back, but this closes the inner valve, and so the water has to go up the supply pipe. At the same time, the rush of pressure being removed, the waste valve opens again, and the whole process repeats itself over and over.

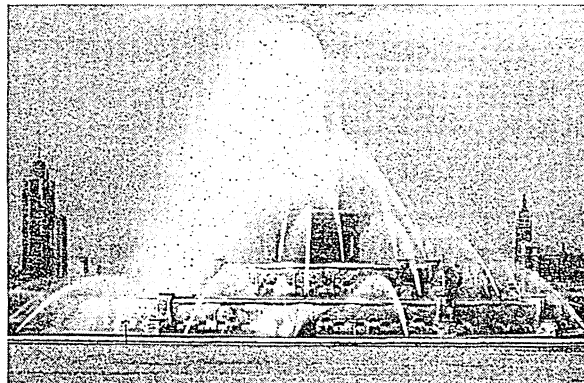
THE POWER OF THE HYDRAULIC PRESS



Here we see how a hydraulic press gets its enormous power. The small piston has a surface equal to one square inch. It pushes on the water, therefore, with a pressure of 100 pounds to the square inch. When this pressure is carried over to the larger piston, with a surface of 900 square inches, you naturally get a total pressure there of 90,000 pounds. The picture at the right shows how this principle is used in an actual press.



Hydraulic pressure may make the water play in a fountain as lively as the one at the right. A simple diagram, at left, shows the principle. The water confined in a tank reaches the level A. It is allowed to run out in a pipe at the bottom with an outlet, B, where pressure from the tank makes it jet out in a fountain.



poses, not compressible, and pressure exerted on any part of liquid in a closed vessel will be transmitted equally to all parts of the liquid. This principle was discovered by Pascal, the great French thinker who lived in the 17th century.

One of these machines, the hydraulic press, is so powerful that a man, working an ordinary pump handle, can lift hundreds of tons of weight with it. It seems that this would be possible only with very complicated machinery, but as a matter of fact the hydraulic press is very simply constructed. We have a tank containing two pistons, one much smaller than the other. If the smaller piston is one inch square, and the other 30 inches square, and we exert a pressure on the smaller piston of 100 pounds, the larger piston will hold up a weight of 100 pounds to each square inch of its surface—30 x 30 x 100, or 90,000 pounds. If the small piston is a pump that lets in more water with each upstroke, the large piston is slowly but surely raised, exerting its enormous pressure.

Uses of the Hydraulic Press

Before more rapid machinery was invented the hydraulic press was generally used for pressing oil from cotton seeds, for punching holes in steel plates, and for pressure in baling hay, paper or cotton. Lead and tin pipes are sometimes made with the hydraulic press. These metals become plastic under tremendous pressure and flow out of the prepared orifices in the same way that macaroni is forced from the machine in which it is made by moderate pressure on the dough.

In hydraulic engines water under pressure pushes back the piston head until a sliding valve is opened by which it flows out. These engines are slow, and have been largely replaced by electric motors, although they are still occasionally used for hydraulic drive elevators or for pumping air for pipe organs. Turbines and water wheels are other forms of powerful machinery operated by water power, and used for many purposes (see Turbine).

"Hydraulics" (from the Greek *hydor*, "water" and *aulos*, "pipe") is the name which we give to the science which treats of the flow of water or other liquids in motion. The designing of dams, aqueducts, canals, and pipe lines is an important application of this science (see Water; Water Power; Waterworks).

HYDROCHLORIC ACID. One of the most important acids in scientific work and in industry is this colorless compound of hydrogen and chlorine (HCl). It is manufactured by treating common salt (NaCl) with sulphuric acid (H₂SO₄), yielding sodium sulphate as a by-product; also by burning chlorine gas inside containers filled with hydrogen. The pure product is a gas (hydrogen chloride), which develops acid properties only when dissolved in water. A cubic foot of water will absorb 455 cubic feet of the gas.

Gastric juice contains normally .2 per cent of hydrochloric acid. It helps to dissolve the minerals in our food and acts in part as an antiseptic. Hydrochloric acid unites with most metals and metallic oxides to form salts known as chlorides (see Chlorine).

HYDROGEN. When a cold plate is heated over a gas flame, beads of water gather on the under side, as if the porcelain were sweating. But the fact is that the flame itself is manufacturing water, for the gas contains the element hydrogen, which forms water (H₂O) when it burns or unites with oxygen. Hence the name hydrogen, from Greek words meaning "water-former."

Hydrogen is a colorless, tasteless, odorless gas. It is one of the most widely distributed of all chemical elements, ranging from a considerable depth in the earth to the upper atmosphere. The spectroscope reveals it in the sun and stars; it enters into all acids and forms thousands of compounds; and it is one of the four most abundant elements making up living matter (see Acids and Alkalies; Biochemistry).

Hydrogen can be made to give us one of the hottest flames known, about 5,000° F. One way this heat is applied is by means of the oxyhydrogen blowpipe. In this, jets of hydrogen and oxygen from different tanks are mixed in the proportion of two to one. As they flow from the blowpipe tip they burn with a flame so hot that it can cut metal almost as easily as a knife cuts cardboard.

Being the lightest of all elements, free hydrogen tends to escape to the upper atmosphere. This tendency makes it the most buoyant gas for balloons; but since it is inflammable, the slightly heavier gas helium is preferred (see Helium).

Hydrogen is prepared in many ways; one method employs the action of acids on metals. Some metals will react with cold water, liberating hydrogen from the water; some less active metals will form hydrogen from hot water or steam. It can be prepared from the electrolysis of dilute acids or alkalies (see Electrolysis), or from water containing small amounts of any conducting substance. The action of steam on coke or coal will yield hydrogen mixed with carbon dioxide or monoxide, and this mixture is now used in making synthetic methyl alcohol (see Alcohol).

Many organic compounds contain carbon atoms that have not exercised their full valence of four (see Carbon; Chemistry). Such compounds are called "unsaturated"; under proper conditions they will absorb more hydrogen, and the process is called *hydrogenation*. This process was first applied to animal and vegetable oils to reduce their disagreeable odors or to harden them. The changes are chemical, new compounds being formed (see Oleomargarine). Such oils are used in making soap and candles. Cottonseed-oil so treated is an edible oil. Lately hydrogenation has become of great importance in increasing the yield of gasoline from crude oil (see Petroleum), in recovering oil and gasoline from coal, and in various other processes.

The chemical symbol of hydrogen is H. Its atomic weight is 1 (or 1.008 according to the more recent international table of atomic weights). It has been liquefied at -423° F., and frozen at -434° F.

For many years scientists believed that the hydrogen atom contained a positive nucleus, called a proton, and one negative electron (see Atoms and Electrons). In 1931, however, Dr. H. C. Urey, in trying to account for water containing isotopes of oxygen (see Chemistry) found hydrogen atoms with nuclei having twice the weight of protons, by detecting their lines in the spectroscope. This kind of nucleus he called a *deuteron*, and the kind of hydrogen containing it was named *deuterium*, with chemical symbol D. In 1934 Lord Rutherford found triple-weight hydrogen. The simplest compound of deuterium is "heavy water" (see Water). These discoveries have forced revision of many important scientific principles (see Physics).

HYDROM'ETER. A floating body sinks deeper in a light than in a heavy liquid. This principle is applied in the hydrometer (from Greek words meaning "water measurer"), an instrument for determining the specific gravity, or density, of liquids. It is usually a glass tube, weighted at one end to keep it upright, and marked with a scale. This scale may directly indicate specific gravity, or it may consist of arbitrary degrees, as in the Baumé scales. Common uses of hydrometers are to test the solutions in storage batteries and automobile radiators, and to determine the richness of milk.

HYENA (*hī-ē'nā*). This unpleasant animal, about the size of a large dog, is noted for its cowardice and the unearthly shrieks, like the laughter of a maniac, which it utters when excited. It lives in caves and

These carnivorous mammals are related in structure to the cats and the civets. They are ungainly creatures with large heads, and their fore legs are longer than the hind legs, which gives them an awkward, shambling gait. Their powerful teeth and jaws are capable of crushing the hardest bones. There are three varieties of the hyena: the striped, the spotted, and the brown. Probably no other animal has such a reputation for downright meanness and it is therefore a striking fact that even the hyena has the capacity for disinterested affection in his disposition. Herr Schilling, a distinguished German naturalist, who brought two hyenas home with him from Africa, found that they would leave their food—even a beef-bone, which a hyena loves above all things—and trot over to him to be petted! We might also enter

A HORRID FEAST IN THE DESERT



These are Striped Hyenas, feasting on the carcass of some creature, killed by a lion, perhaps, and left half-eaten for the desert scavengers. Two Jackals have come up, and we can almost hear these four slinking cowardly creatures snarling at one another over the meal. Hyenas love bones, and so powerful are their jaws they can crack even the leg bone of an ox and so get at the marrow.

holes in Africa and southern Asia, sleeping by day and coming out at night to feed on carrion and start its unearthly howling. The hyena performs a valuable service to the health of the communities which it infests by devouring dead animals and thus acting as a scavenger. So cowardly that it rarely attempts to defend itself, it does not dare to attack an animal that is standing still; but it often so terrifies horses and cattle that they run till they fall from exhaustion. Then the hyena tears its victim to pieces. It was formerly much dreaded in South Africa, where it often entered Kaffir dwellings at night and carried off children sleeping by their mothers.

on the credit side of the hyena's case that its ancestors contributed some valuable data to the history of life on earth. The hyenas that once lived in England and France used to drag bones of other prehistoric animals into caves, where they have been preserved for modern scientists to study. These remains have helped in tracing the evolution of living animals.

Hyenas (family *Hyaenidae*) differ from all other large carnivora except the African hunting dog by having only four toes on each foot, by the length of the forelegs compared with the hind legs, and the nonretractile claws. Chief varieties: *Hyaena striata*, striped hyena, found throughout India, Persia, Asia Minor, and north and east Africa; *Hyaena crocuta*, spotted hyena, south Africa.

YOUR HEALTH *and* HOW TO KEEP IT

HYGIENE (*hī'jēn*). The word "hygiene," with all of the practical meaning that it has today, came to us from the myths of ancient Greece.

According to the old legends, the god Apollo when displeased with men punished them with disease. Illness was thus believed to come from the gods, and so the only way that men could rid themselves of disease was with the aid of the gods. People therefore prayed to Apollo for health.

Later, according to the myth, Apollo had a son named Aesculapius, who was trained in all the arts of healing by the centaur Chiron. Aesculapius lived among men; he and his children were great healers.

At length, so the story says, Hades, the god of the underworld, complained to the god Zeus that Aesculapius kept men so healthy that none died and came to his region. Zeus therefore killed Aesculapius with a thunderbolt. Apollo then had him made into a god; and so, from the heavens, Aesculapius continued to watch over men and answer their prayers for health.

To worship Aesculapius the people built temples and in them put statues of the god and also of his two daughters. One of the daughters was named Panacea. She was the goddess of all healing. Her name has survived in only one term in our language. A "panacea" is now a remedy that heals all diseases. And such a remedy is as mythical as Panacea herself.

The other daughter was the goddess of health. Words derived from her name are much in use in our language. This entire article is written about one of the words. The name of this goddess was Hygeia.

Although we still use her name, we no longer seek health by worshiping Hygeia. "Hygiene" means now all the principles and rules which have for their purposes preserving and promoting health.

Scientific Basis of Hygiene

The Greeks believed that illness came from the gods, and so had a supernatural origin. We no longer hold that belief. Instead, we know that disease arises from natural causes; that is, causes that can be explained by the knowledge of science. It is from this knowledge that we get the principles and rules which we call hygiene.

Health is the most valuable possession that any man can have. But what is health? The word itself means whole and sound, hence free from injury and

disease. Prevention of injury and disease is still the most important part of hygiene. But this is not all that hygiene has as its aim. Hygiene is intended not only to preserve health but to promote *good health*. And good health is something far beyond mere freedom from injury and disease. Good health signifies that every part and every function of the body, and of the mind as well, is in the finest possible working order. It is only when we are in this state of good health that we have the fullest use of all the powers with which we are endowed.

Thus there are two sides to hygiene: first, the preservation of health by preventing disease and injury; second, the promotion of good health by always keeping oneself in the finest working order.

Furthermore, there are two broad divisions in the application of hygiene. One is hygiene applied to the community; it is called "public health" (see Health Department). The other is hygiene applied to the individual; it is called "personal hygiene."

Community Hygiene

Community hygiene deals with those broad measures which touch upon the lives of all citizens. Rules of hygiene are thus written into city, state, and national laws. The Pure Food laws which the Federal government enforces are measures of hygiene. Each state has further

laws regarding the purity of foods. And each city, with its health department to enforce them, has still other laws and regulations that not only concern the purity of foods, but extend to many other matters vital to the health of every citizen. Sewage and garbage disposal systems, water purification, quarantine for infectious diseases, and compulsory vaccination are some of the measures of public hygiene which have contributed to make the modern city the healthiest place the world has ever known.

These measures of public health can provide, for all citizens, surroundings as safe as our knowledge can devise. But they cannot control the private actions of each citizen. The city may furnish pure water, but that fact does not prevent a boy tramping in the country from drinking at a stream that may contain typhoid germs. There can be no laws that will prohibit anyone from straining his eyes because of improper lighting in the home, from overeating or under-eating, from standing incorrectly, from exercising too little or too much, from obtaining insufficient sleep,

Health is better than wealth.—ENGLISH PROVERB.

He who has health is rich and does not know it.—ITALIAN PROVERB.

Health and intellect are the two blessings of life.—MENANDER.

Health and good estate of body are above all gold.—ECCLESIASTICUS.

A healthy body is the guest of the soul; a sick, its prison.—LORD BACON.

The first requisite of good generalship is good health.—NAPOLEON.

In any of the learned professions, a vigorous constitution is equal to at least 50 per cent more brains.—MATHEWS.

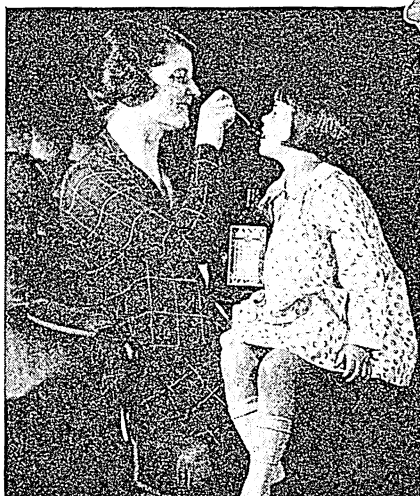
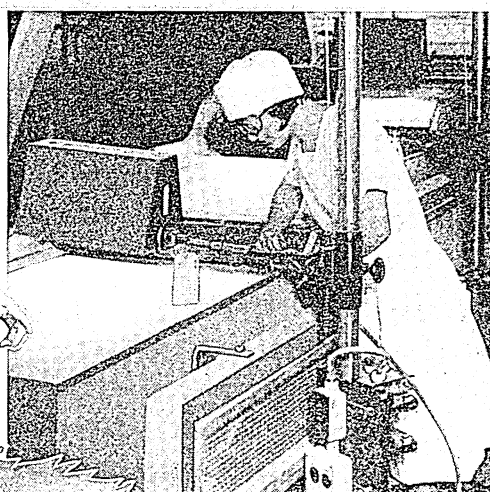
What a disgrace it is for a man to grow old without ever seeing the beauty and strength of which his body is capable!—SOCRATES.

Joy, temperance, and repose slam the door on the doctor's nose.—12TH CENTURY MANUSCRIPT.

WHY THE SUN IS THE BEST OF HEALTH-GIVERS

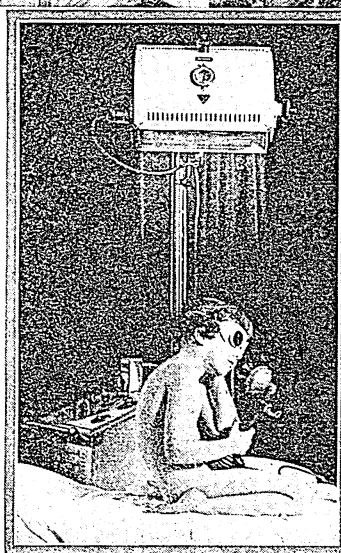


THE SUN is the greatest doctor in the world! But only lately have the world's doctors understood just how the sun manages to give us his medicine. The mystery lies in "ergosterol," a chemical in our skins, and in "ultra-violet rays," certain of the sun's rays which you can't see. These rays give us a fine coat of tan, activate the ergosterol, and create what is known as vitamin D. This vitamin enables our bodies to make proper use of the lime and mineral salts in milk and vegetables, so that our teeth and bones may grow strong. The youngsters building a snow fort (above) while the sun browns them, and the baby having a gorgeous time at the beach, are getting vitamin D in the easiest, pleasantest way. The very good girl, below, taking cod-liver oil without complaint, is getting it, too, for cod-liver oil is just full of vitamin D. But even the sun bath can be overdone. Never stay too long in the sun, just long enough to feel invigorated.



ARTIFICIAL SUNLIGHT, containing even more ultra-violet rays than the natural sunlight, is now produced by carbon arc and mercury-vapor quartz lights. It has been found that by irradiating certain foods they can be made to contain vitamin D. The picture at the upper right shows the equipment used in irradiating cereal products by a process discovered by Prof. Harry Steenbock of the University of Wisconsin.

LAMPS which bathe the patient in artificial sunlight are now successfully used. Physicians warn, however, that these lamps are dangerous in the hands of the amateur, who should never use them except when following a doctor's instructions.



from wearing unsuitable clothing, from having his home poorly ventilated, and so on through the long catalogue of the broken rules of personal hygiene. And we all know that health may be impaired by breaking the rules of personal hygiene quite as much as by breaking the laws of public hygiene.

What Personal Hygiene Does

It would, of course, be absurd to say that everyone by practising personal hygiene could become strong and vigorous and filled with buoyant health. Unfortunately we are not all born with the same possibilities for strength and health and vigor. Some of us are, from birth, weaker and less vigorous than others. Personal hygiene cannot make up for deficiencies of this kind. But what it can do is to assist each individual to the fullest realization of the powers which he is capable of attaining. And in reality the handicaps of life result far more often from lack of care than from inborn defects and weaknesses.

The first step toward self-improvement in personal hygiene is to have an inventory of the body—a physical examination by a physician. In a thorough examination the physician will study every vital system of the body: the respiratory, circulatory, excretory, nervous, and digestive systems. He will inspect teeth, mouth, nose, throat, skin, and scalp. He will also consider weight, height, and posture. If he finds correctable handicaps—and at least 50 out of every 100 young people will show one or more—he will recommend the proper measures to overcome them. Such a general physical examination is needed once a year.

In addition, the routine of personal hygiene calls for a dental examination at least twice a year. In young people the teeth need especial attention, to avoid serious trouble in later life. (*See Teeth.*)

Physical and dental examinations must be carried out by physicians and dentists. But the remainder of personal hygiene lies in the hands of the individual.

Our Chief Food Requirements

One of the most obvious demands of the body is for food. But unfortunately the body does not tell us what sort of food shall be eaten; it simply demands enough of any kind to satisfy hunger. The selection of the proper foods and the development of the proper food habits must be guided by a knowledge of diet and of the workings of the digestive system. (*See Food.*)

Food is the sole source of energy for all activities of the body and mind. A good diet supplies not only energy but also all materials needed for growth, repair, and proper functioning of the body.

In brief, the requirements for a complete diet are these:

1. Enough fuel foods to give the body the energy it needs.
2. Enough protein to replace that lost in the wear and tear of living activity.
3. Enough minerals to keep the bodily store adequate for good health.
4. Enough vitamins to prevent disease and to maintain good bodily function.
5. Enough roughage to allow the intestines to carry out proper elimination.

Fuel foods include the sugars, starches, fats, and proteins. Bread, potatoes, beans, macaroni, cereals, butter, olive oil, milk, and all sorts of meats are fuel foods.

Proteins are found in meats, cheese, and milk, to a less extent in bread, cereals, and beans, and to a still lesser extent in other vegetables.

The *minerals* that the body needs are many, but all except two are supplied by any reasonable sort of diet. These two are lime and iron.

The best source of lime is milk. Milk should, for this reason if for no other, be a part of everyone's diet. A quart a day is best, for most people. But it is not necessary to drink all of this quart; much of it may be obtained from soups, creamed vegetables, custards, and many other dishes, if they are made with milk.

Iron is needed to allow the body to make the red material which gives the blood its color and which has the important function of carrying oxygen. Foods rich in iron are molasses, beans, peas, shredded wheat, spinach, oatmeal, and prunes. Red meat also contains iron, but meat that has had the blood washed from it contains very little.

Vitamins and Roughage

When *vitamins* are absent from the diet, serious diseases such as scurvy, rickets, and beri-beri develop; when the vitamins are present but are inadequate in amount, growth fails to proceed normally and there is susceptibility to infection and loss of bodily vigor. Most of the needed vitamins are found in fruit, milk, butter, leafy vegetables, and tomatoes. But there is one vitamin that the body makes for itself if the skin is exposed to sunlight. Where sunlight is lacking it is necessary to supply children with this vitamin, obtained in the oil from fish livers. (*See Vitamins.*)

The final requirement of the normal diet is *roughage*. Roughage is indigestible material, such as a portion of the pulp of fruit, of lettuce, and all other leafy vegetables. If the diet contains only foods that are digested and absorbed completely, such as eggs, meat, butter, and sugar, there is no residue for the intestines to move along and thus flush and clean themselves.

Laxatives and physics of all kinds are poor substitutes for proper diet. When they are needed they are best taken only under the direction of a physician, for in some conditions they may be dangerous. Never should a physic be taken when there is a pain in the abdomen, unless the physician has made an examination and found the appendix to be normal. If the pain is due to appendicitis, a physic may make the disease worse and even cause the rupturing of the appendix.

Diet and the Control of Weight

Many false beliefs and fads have grown up about diet. But sensible people disregard all fads. They select their diet with a knowledge of what their bodies need. Everyone who is interested in personal hygiene soon learns that likes and dislikes for this food or that have no place in the lives of those who truly seek good health. And besides, the liking for any food quickly comes with the eating.

The control of weight is closely connected with diet. When one eats more of the fuel foods than the body needs, the excess is stored away as fat and weight is gained. When too little of these foods is eaten, the fat of the body is used up and weight is lost. Young people who are of normal weight appear more resistant to certain infectious diseases than do those who are underweight. But sometimes so much fat is put on that it is desirable to remove some. The only way it can be removed is by using up in exercise more energy than the food supplies.

During dieting the body needs as much protein, minerals, vitamins, and roughage as at any other time. The supply of these substances must be carefully maintained. The only change to be made in the diet is to reduce the amount of starches, sugars, and fats. "Dieting fads" may be dangerous to health, and in reducing weight it is always safest to have a physician outline the diet.

How Many Meals a Day?

How often one should eat, is a question raised in hygiene. Frequently it is answered by saying that three meals a day is the proper number and that nothing should be eaten between meals or before going to bed. But newer knowledge on the subject apparently would show this answer to be wrong. The body is more efficient when food is taken in five or six meals rather than three. Fatigue and irritability appearing in the late morning and the late afternoon often arise from a need for food. Many specialists in nutrition now recommend the following schedule for meals:

1. Breakfast
2. Mid-morning lunch
3. Noon meal
4. Mid-afternoon lunch
5. Evening meal
6. Bedtime lunch

But in following this schedule of five or six meals a day there is one important caution to be borne in mind. The mid-morning and mid-afternoon lunches are a part of the daily diet. Because of them less food will be eaten at the regular meals. Consequently these lunches must not be made up of candy and soft drinks and ice cream sodas. They should consist of milk, sandwiches, fruit, soup, and other articles that fit into the total daily diet.

Many people condemn the lunch before going to bed. But their belief in its ill effects is based upon the kind of food eaten and not the time at which it is eaten. Pickles, cheese sandwiches, Welsh rarebit, and other dishes hard to digest are certainly not desirable just before going to bed. The articles chosen should be those that might be eaten with comfort for breakfast: warm milk and crackers, custard, toast, fruit, and the like.

Vital Importance of Chewing

No matter at what time food is eaten there is one positive rule of hygiene about the eating. The food must be chewed thoroughly, and for two excellent reasons. First, after the food leaves the mouth, all

digestion is chemical (*see* Digestion). Digestive juices poured over it act upon it to dissolve it. The smaller the particles, the easier is digestion. There are no teeth in the stomach or intestines, and so when the food leaves the mouth there is no further chance for it to be divided into smaller particles.

The second reason lies in the fact that one of the digestive juices is mixed with the food in the mouth. This juice is saliva, which digests starch. When the food reaches the stomach this digestion by the saliva continues for an hour or more before the stomach juices reach the food and stop the action of the saliva. If the food is insufficiently mixed with saliva by chewing, the salivary digestion cannot take place and the food tends to sour in the stomach.

The old belief that water should not be drunk at mealtimes has as its only basis this fact: Many persons treat their food like pills and wash it down with a drink of water instead of chewing it. Water in any quantity is perfectly harmless at meals, provided it is drunk only when the mouth is empty and the water is not used to moisten or wash down dry foods. And milk, we should remember, must be treated not as a drink but as a solid food, for it becomes solid in the stomach. To prevent indigestion, milk must be "chewed" by taking it in small swallows.

We know too that neither the saliva of the mouth nor the digestive juices of the stomach can be secreted well if the emotions are upset or if the mind is concentrating. An important rule of hygiene says that for good digestion meals should be eaten in peace of mind and comfort of thought. Hence it is harmful to study at meals, or to scold and tease anyone. Rather, for best digestion, meal-time should be a time to joke, laugh, and carry on pleasant conversation.

Allergy and Food Poisoning

Certain foods which most people can eat and enjoy cause illness in occasional individuals. They become nauseated; they may even develop a skin eruption called hives. This rare disturbance (called allergy) is closely related to hay fever. But there is no ground for the belief that certain articles of food cause indigestion if they are mixed together. Thus many persons refuse to drink lemonade and milk in the same meal, or eat ice cream after lobster. The fact is, however, that any food that can be eaten and digested in comfort can be taken without danger in the same meal—or even in the same dish—with any other food that can be eaten and digested in comfort. Food mixtures upset the stomach only when one or more of the ingredients is indigestible or spoiled.

Food poisoning results when the food eaten is spoiled, infected with bacteria, or contains a poisonous substance. Thus toadstools eaten by mistake for mushrooms cause food poisoning because the toadstools are themselves poisonous. Again, food that has spoiled contains not only bacteria but the poisonous chemical substances that result from the action of the bacteria. But by far the commonest type of food poisoning results from human contamination. There

are certain dangerous bacteria that may sometimes be present on dirty hands. If the hands touch the food, the food is contaminated. If the food is eaten, food poisoning results. These bacteria are destroyed by heat. Therefore this type of food poisoning comes most often from cold foods that require handling, such as sliced meats, sandwiches, and deviled eggs.

Because of the dangers of food poisoning, great care must be taken in handling food. The kitchen must be scrupulously clean and free from flies; the icebox clean and neat. Only healthy people should handle or serve food and their hands should be washed and their finger-nails cleaned before they touch any food or even any dishes. And finally, the dishes should not only be washed to make them look clean, but scrubbed and scalded in hot water to remove bacteria and then thoroughly dried.

Another type of poisoning may result from the use of alcohol or coffee or tobacco. Alcohol is an anesthetic. It acts on the body in the same way as does the ether used to produce unconsciousness for surgical operations. Coffee contains a drug called caffeine, which stimulates and irritates the nerves. Tobacco contains a drug called nicotine, that also acts on the nerves. All three of these drugs, however, are far more harmful to young people than to adults.

Facts About the Air We Breathe

Of equal importance with food in supporting life is the air we breathe. In the lungs the blood takes part of the oxygen from the air and in turn puts into the air a gas called carbon dioxide (*see Respiration*). This is the same gas that forms bubbles in soda water and ginger ale (*see Carbon Dioxide*).

At one time it was believed that what is called "bad air" in poorly ventilated rooms resulted from the continual removal of oxygen and the continual addition of carbon dioxide by people breathing in the room. We know now that oxygen and carbon dioxide pass through plaster and brick and wooden walls so rapidly that there is never any danger of the air in a room containing too little oxygen or too much carbon dioxide.

Regarding oxygen in the air, therefore, the rules of hygiene have little to say. But they have much to say regarding other substances in the air. Dust, bacteria, pollen, and poisonous gases may all make air harmful to breathe.

All air contains some dust. The small amount normally present is removed in the nose and, to a less extent, in the windpipe. These passages thus protect the delicate structure of the lungs from irritation by dust. If breathing is through the mouth instead of the nose, part of this protection is lost.

When there are large amounts of dust in the air the nose and throat themselves may be irritated. The air in houses usually contains far more dust than does the outside air. Removing dust thus becomes a part of hygiene in the house. One of the most satisfactory ways of reducing the dust is to use a vacuum cleaner instead of a broom. The cleaner removes the dust; the broom stirs it up.

The presence of poisonous gases in the air is a far more serious matter than is the presence of dust. In the house there are two main sources from which dangerous gases may come: the coal furnace or stove, and the gas stove, gas jet, and gas water heater. In the garage is a third source—the automobile.

Automobile exhaust gas is very poisonous. It contains carbon monoxide (do not confuse it with carbon dioxide mentioned above). An automobile should never be run in the garage for a single instant unless the doors are wide open. Many lives have been lost because of ignorance of this fact.

The same dangerous gas may come from the furnace or coal stove. Carbon monoxide is nearly always present in coal smoke, especially when the fire has been banked and the dampers closed. If smoke finds its way into the house through a faulty flue or chimney, or from a crack in the firepot of the stove or furnace, it carries with it the carbon monoxide. Good hygiene includes the regular inspection of all household equipment and the immediate repair of any defects that are found to prevent such an occurrence.

This same carbon monoxide is also the poisonous part of illuminating gas used for cooking, heating, and lighting. If illuminating gas escapes unburned, its dangerous carbon monoxide finds its way into the air of the rooms. But illuminating gas is harmless when burned, and can be used with perfect safety by those who know its dangers and guard against them. There are a few special don'ts that everyone should know:

1. Don't use a rubber tube on any type of gas fixture. The hose is easily pulled off, allowing the gas to escape.
2. Don't allow the cocks on the burners of the stove to become loose so that they may jar open.
3. Don't allow a small child to play near a gas stove. He may in ignorance turn on the gas.
4. Don't allow food or water to boil over on the stove. It may put out the flame but it does not turn out the gas.

The Real Purpose of Ventilation

The air of all rooms, as was said above, has plenty of oxygen, it never has a harmful amount of carbon dioxide, and it rarely has in it the dangerous poisonous gases. Yet for good hygiene it is always necessary to ventilate rooms in order to keep the air fresh (*see Heating and Ventilation*). This freshness has nothing to do with the chemical nature of the air or with breathing. "Bad air" is air that is too hot, or too moist, or too dry; and especially it is air that is too still. Air that is still and warm does not allow the body to give off its heat in comfort. Still air is depressing; moving air is invigorating. Moreover, when there is no movement the air tends to gather in layers, with the hot air near the ceiling of the room and the cold air along the floor. This condition is unhygienic.

Poor ventilation resulting in "bad air" occurs mainly in the winter time. In our northern regions it is necessary to close the windows and to heat the air of the rooms. Often the air is overheated, dry, and still. With careful attention to the heating plant—and that is a regular part of the hygiene of the house—the overheating can be prevented. The proper tem-

perature for heated air is a matter of opinion. But most authorities agree that 68° F. is as warm as it should be. If the air can be well moistened, the temperature may be kept as low as 62° or 65°. Older people require warmer air than is comfortable or even healthful for young and active people.

Bedrooms should be kept cool at night and well ventilated by means of a partially opened window. In the past it has often been a fad with many people to keep the bedroom cold and with a breeze—often a gale—blowing through it from wide open windows. This condition while harmless to those in vigorous health may be harmful to those who are ill, or even to those who are troubled with frequent colds. Cold air puts a burden on the nose and throat. Fresh air is needed in the bedroom, but ventilation—like everything else in good hygiene—should be in moderation.

It is a common belief that drafts of cold air, wet feet, and wet clothing cause people to "catch cold." Certainly any of these conditions will make a cold much worse; they will also make the muscles stiff. They are to be avoided under all circumstances. But a cold is an infection. Infections, though they may be made worse, are not acquired by getting the feet wet. They are acquired from other people who have colds. Arctic explorers do not develop colds so long as they stay away from other people.

How to Avoid Colds

Colds are spread by germs carried in minute droplets spread in the air during coughing and sneezing. By keeping the air in motion good ventilation helps to disperse these droplets and thus aids in preventing the spread of colds. Colds are rarely "caught" out of doors but they are frequently "caught" in poorly ventilated rooms or where people come in close contact with one another as in trains, schools, and theaters.

The germs that cause colds may be spread in other ways: by shaking hands with a person who has a cold, by using his handkerchief, by drinking from his unwashed glass, and, in short, by touching or using any article that he has recently touched or used. To avoid colds, avoid people who have colds.

There are certain definite rules of hygiene to be followed by those who have caught cold:

1. Avoid going near other people. Do not spread your cold!
2. Go to bed on the first sign of the cold and stay there until it is over. This is the safest and wisest treatment for a cold. It is the only measure that may shorten the length of the cold. And it is an almost certain method of preventing the cold from spreading deeper into the throat and lungs and causing bronchitis or pneumonia.
3. Avoid getting the skin wet or chilled.
4. Take the temperature with a mouth thermometer twice each day. If there is fever, call a doctor at once.

If these simple rules of hygiene were followed there would be far fewer colds and, what is more important, far fewer cases of bronchitis and pneumonia.

One of the dangers of any cold is the possibility that the infection in the nose may be forced up the minute tube (the Eustachian tube) that leads from the throat to the ear (see Ear). Infection of the ear may follow.

Not all cases of ear infection come from this cause, but many do. And many of these could be avoided by a simple rule of hygiene in blowing the nose. Never stop up both sides of the nose in blowing; always leave one open. If both sides are closed, the blowing may force the infectious material into the ear.

If the ear canal becomes filled with wax, a physician should clean it. But it is dangerous to attempt to do so at home with a hairpin or the rolled up end of a towel, for the wax may be pushed back into the canal and strike against the head of the drum. There is an excellent and sarcastic German proverb on the care of the ears. It is: "Never put anything smaller than the elbow in the ear." This caution, however, does not mean that the outer ear should not be washed.

Hygiene of the Eyes

The rules of hygiene for safeguarding the eyes are much more extensive than those for the ears. The eyes are the most important of the sense organs (see Eye). We normally depend upon them for more than 80 per cent of our perception of our surroundings. Any defect in the eyes that interferes with good seeing is thus a serious handicap to all work and pleasure. Moreover, the straining to see well with defective eyes harms them still further and causes headache and irritability. Defects of the eyes can usually be corrected. Therefore the eyes should be examined and the vision tested once each year by an eye specialist.

Even when the eyes are capable of seeing well they are often forced to work under conditions that strain and injure them. The eyes, especially those of young people, may be strained by reading small type. In all reading the head should be held up straight, with the book supported upright, not laid open on the desk. Rest the eyes frequently by closing them or looking off into space for a moment.

Good seeing requires good lighting. Poor lighting strains and injures the eyes. Use daylight when possible for reading and writing and sewing. When artificial lighting is necessary, the arrangement of the lights becomes an important part of hygiene.

Never read or write or sew in a dim light or in a place where shadows fall across the work. Always use a bright light, but carefully avoid glare. There are two kinds of glare; both are harmful to the eyes. Direct glare results when an unshaded light shines directly into the eyes. Indirect glare results from the reflection of the light on the page of the book. There is a simple test for the harmful indirect glare. With the book held in position for reading, move a small hand mirror back and forth across the page. If an image of the light bulb is seen in the mirror, indirect glare is present. The book or the light should then be moved until the image of the light can no longer be seen in the mirror.

Good lighting in the house not only saves the eyes from strain but helps to prevent accidents. Many accidents result from falling over furniture or other obstacles in dark halls and passageways. And many result from falling down dark stairways. Light-colored

wall and ceiling decorations help toward better illumination. Whitewashing the cellar serves this same purpose and in addition makes it much easier to see dirt that should be removed.

Any injury to the eyes, any infection, even any redness, should be treated by a physician. The eyes are far too valuable to risk any "home treatment."

Care of Skin and Scalp

In contrast to the eyes, the skin of the body needs "home treatment" every day. This treatment is washing. Cleanliness is the most important step not only toward good health of the skin but toward good complexion as well. The skin of the whole body needs a daily cleansing with warm water and soap. The skin of the hands and face and feet need even more frequent bathing.

It is important to dry the skin thoroughly after washing. And this is particularly true in the winter time, for then wet skin chaps and roughens.

Many girls and women use cosmetics on their skin—powders, creams, and lotions. Chapped skin is soothed by putting grease on it, but the regular use of grease makes the skin tender so that it chaps easily; it may also cause pimples in young people. There are many absurd beliefs about the "beautifying" effects of cosmetics, derived largely from advertisements. The facts are that the skin cannot be fed or renewed from the outside; this can be done only from the inside. Cold cream is merely grease; vanishing cream is a sort of soap; and face powder is a dust made of starch or crushed talcum rock. Some cosmetics are actually poisonous. Real beauty of complexion comes from good health and cleanliness. Cosmetics are used mainly to cover up the blemishes that come from lack of good hygiene of the skin.

For the hair and scalp the best "tonic" is cleanliness. They should be washed at least twice a week. There is an old superstition that washing the hair harms it by taking out the grease. In reality the only harm that can come from washing is from leaving soap on the hair, from too little rinsing, or from failure to dry the hair and scalp thoroughly.

Effects of Poor Posture

Good posture, like good complexion, is a matter both of beauty and of health. The human body is not handsome when the shoulders are slouched and sagging, the back bent, and the neck thrust forward. Equally unbecoming is a slouching posture in sitting. When we see people with these bad postures we get the impression that they are tired, or lacking in energy, or weak. Sometimes it is fatigue that causes the bad posture, but more often it is carelessness and poor habits of hygiene. Moreover, bad posture affects health. Muscles are pulled and strained; the back and legs ache; and sometimes the organs in the abdomen are pushed out of place.

Clothing as well as posture plays a part in hygiene. Clothing is intended to keep the body warm, but not too warm. Therefore in winter weather it is best to wear clothing suited to the indoor temperature of our

heated rooms and provide plenty of wraps, coats, leggings, and overshoes to use when going out of doors. The clothing next to the skin should always be kept dry. The underclothing should be changed frequently—daily is best—for it becomes covered with bacteria from the skin. Skin infections and unpleasant odors may result from soiled underclothing. The clothing should be loose. It is best to support it entirely from the shoulders.

This warning against tightness applies especially to shoes. Because they are stiff and firm, misfitted shoes may deform the feet. The shoes for young people who are growing need especial attention. Sometimes they become too small for safety even before they are worn out. For the best foot health, shoes should have low heels and broad toes. They should be of soft leather and ventilated to allow evaporation of perspiration.

Importance of Exercise and Sleep

Exercise is an important part of good hygiene (*see Physical Training*). If exercise is not taken, the body gradually loses its reserve of strength. The muscles become soft and flabby, and the vital organs do not carry on their functions as well as they should. Good exercise does not mean violent exercise but regular exercise. Endurance contests of any kind may be harmful to boys and girls under the age of 16 or 17. It is far better to develop a sound body for a long life than to win a few races and swimming contests in early life. Do not make work out of the daily exercise; make it a pleasure. Walking, dancing, tennis, swimming are good exercise—and so are sweeping and bed-making.

Sleep is more than a rule of good hygiene; it is a necessity. But the right amount of sleep is a matter of hygiene. Some people need more sleep than others, but a rule that suits most is:

- 1 to 4 years, 12 hours of sleep
- 4 to 12 years, 10 hours of sleep
- 12 to 16 years, 8 to 10 hours of sleep

No one can work or study or play well when he is tired and irritable from lack of sleep. For the hygiene of sleep the first requirement is regular hours for sleeping. The other requirements are: a comfortable bed, enough but not too many bed covers, good but not violent ventilation, and a quiet bedroom with windows shaded against the morning sun.

Personal hygiene does not end with the care of the body alone. Good mental and emotional habits are just as important as good health (*see Mental Hygiene*). Some persons are fortunate in having a warm and cheerful disposition that makes life easy for them and for those about them. Such a disposition is a gift even more precious than physical strength and beauty. Others are handicapped by dispositions that are irritable or sullen or indifferent. Such persons can go far toward overcoming their handicaps if they will make persistent efforts at self-control and self-improvement (*see Character and Personality*).

For mental health, in the home and in all situations of life, everyone must give as well as take. Each must be considerate of others as well as of himself.

HYGROMETER. One of the important factors which the Weather Bureau must take into account in making its forecasts is the humidity — the amount of moisture in the atmosphere. To measure this, various instruments are used, called "hygrometers."

One of the simplest is the toy known as the "weather house," at the door of which a man appears if the weather is about to be wet, and a woman if it is to be fine. It is operated by catgut threads, which grow shorter as the humidity increases and lengthen as it decreases, thus moving the figures. Hair also contracts when moist, and is used in the hair hygrometer, moving a needle on a scale as it changes in length.

The wet and dry bulb hygrometer, also called the "psychrometer," is the most generally used. In the "sling psychrometer" type two thermometers are fastened side by side on a stand, exactly alike except that the bulb of one is covered with wet muslin. The thermometers are then whirled or fanned and the evaporation of the moisture in the muslin causes a fall in temperature in the wet-bulb thermometer — rapid if the day is dry, and slight if it is damp. The dry thermometer records the actual temperature of the air, and by comparing the two readings the humidity can be determined from a set of prepared tables.

Another type is the dew-point or condensing hygrometer. This makes use of ether, which evaporates very quickly and soon cools one of the thermometers down to the point at which the moisture in the air begins to condense as dew. From the dew-point and the temperature of the air as given by the other thermometer, the relative humidity can be determined. In chemical hygrometers the moisture in a given vol-

ume of air is absorbed by some such substance as calcium chloride or sulphuric acid, and the increase in weight gives the amount of moisture.

Hygrometers are used in many modern schools and office buildings to measure humidity so that mois-

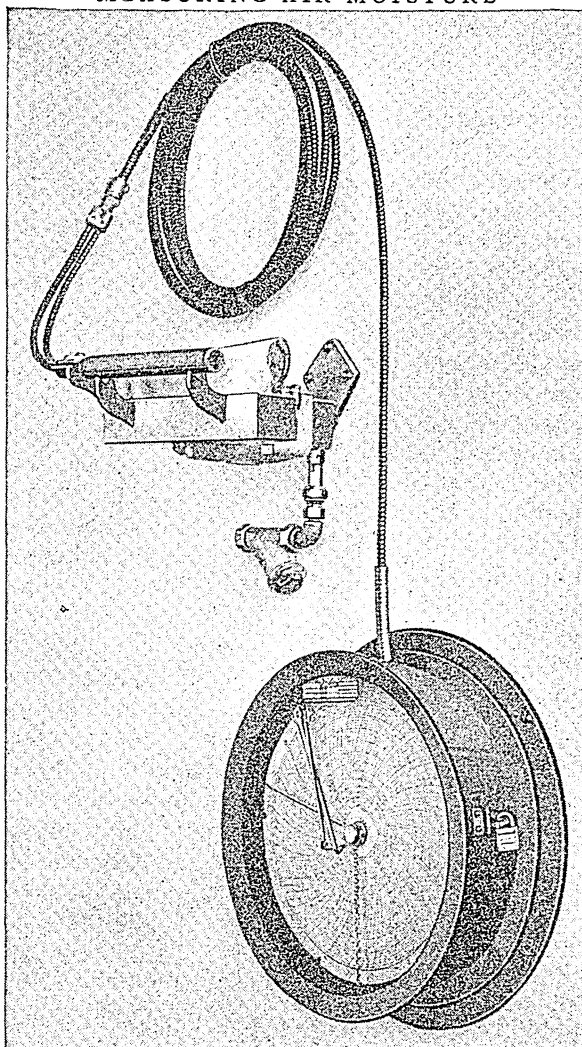
ture can be thrown into the air when the air becomes too dry (*see* Heating and Ventilation). They are also used in industries in which humidity is a factor, such as the manufacture of textiles, cigars, and paper.

HYPNOTISM. Many strange occurrences which were once looked on as miracle, magic, or delusion have been explained by modern science as results of that little-understood mental condition known as "hypnosis" or hypnotism. This condition resembles normal sleep, except that the hypnotized subject may retain some of his active faculties such as the power to walk, talk, and understand what is said to him. At the command of the operator the patient will lose all sensation in a leg or an arm, so that a pin can be thrust in without pain. The heart-beat can be made slower or faster, a rise in temperature and perspiration can be induced, and there are records of cases where drops of blood were made to ooze through the skin. The hypnotized person will perform ridiculous actions, and carry out feats of skill and strength impossible to him under normal conditions. He will "see" people who are

not there and if told that a person, who may actually be directly in front of him, has departed, he will believe it, and may even try to walk over the spot where that person is standing.

In light hypnosis a person may remember the facts of his normal life and may recall when he "wakes up" what he said and did while hypnotized; but deep

MEASURING AIR MOISTURE



In this type of hygrometer, the "bulbs" are closed tubes filled with a volatile liquid and mounted on a frame with the dry bulb in front, just beneath the coiled tubing at the top. A cloth covers the wet bulb and is kept uniformly moist by the water in the tank into which it dips. The tubing connects the bulbs with hollow metal coils in the circular metal case, and when changes in temperature cause the vapor in the tubes to change in volume, these coils expand or contract. This movement shifts the needles over the face of the card, which is kept slowly turning by clockwork. The combined movements trace a temperature record for each bulb. By referring the differences in temperature to special tables, the humidity at any time can be determined.

hypnosis produces a complete loss of memory in both respects, unless the operator orders the patient to remember something. Perhaps the most useful feature of hypnotism is found in what are called "post-hypnotic suggestions." These are suggestions made to the patient while hypnotized, which he will carry out afterward. For instance, if the operator tells him that, when he awakens, he must take off his coat as soon as someone coughs four times, the patient will do so, without being conscious of the reason for the action. It is this effect of hypnotism which is used by certain medical specialists in breaking drug habits and other forms of nervous diseases.

How the Hypnotist Controls His Subject

To understand even the simplest facts of hypnotism, it is necessary to realize the close connection between the mind and the body through the nervous system, which centers in the brain. In sleep the faculties of the conscious brain become dulled and lose connection with the body and with each other. But it is possible to keep one or more of the faculties half awake, as in the case of the fireman who sleeps through any amount of ordinary noise but springs up at the faintest tinkle of the fire alarm. A similar condition is produced in hypnosis. All the conscious faculties are put to sleep, except the faculty to respond to suggestions of the hypnotist. The hypnotist's mind and will take the place of the patient's mind and will, and since most of the ideas which might lead the patient to refuse a suggestion are asleep, the body, which remains active, will answer to his commands. The nerve system, which controls the body and carries sensations to the brain, also remains sleeping until it is called into action, and then it may act most powerfully because it is free from the ordinary burden of the thousands of ideas and sensations which make up our waking life.

Thus the nerves of the heart and other organs, which work automatically and cannot ordinarily be controlled, become open to suggestion.

The methods used to produce hypnosis are usually simple. The patient is asked to fix his eyes on some nearby object and to make his mind a "blank" as far as possible. The hypnotist says a few low soothing words and may even stroke the head or pass his hands before the eyes. A condition resembling natural sleep sets in, except that the operator keeps the patient's attention and prevents complete slumber. Contrary to popular belief, it is almost impossible to hypnotize a normal person against his will, or cause him to do acts which are contrary to his deep-seated principles. Scientists also reject the common notion that a group of persons can be hypnotized unwittingly by magicians or conjurers.

Hypnotism, especially in the form of self-hypnosis, has been practised for many centuries by the devotees of various religious cults in Asia and Africa. Self-hypnosis is doubtless often the explanation for the ability of Hindu fakirs and Moslem dervishes to endure excruciating pain.

Mesmer and Mesmerism

When hypnotism first began to be studied, it was called "animal magnetism" or "mesmerism," after Dr. F. A. Mesmer of Vienna, who used it to heal certain nervous ailments in the late 18th century. It remained a great mystery, however, and was generally associated with superstition and fraud, until modern psychology gave it a firm basis in science.

It cannot be too strongly emphasized that in the hands of amateurs or professional exhibitors the practise of hypnotism may produce the most serious mental disturbances. It should be employed only by expert operators for beneficial purposes.



THE EASY REFERENCE FACT-INDEX

GUIDE TO ALL VOLUMES FOR SUBJECTS
BEGINNING WITH

G-H

TO SAVE TIME

USE THIS INDEX 

EDITOR'S NOTE ON NEXT PAGE TELLS WHY

SPECIAL LISTS AND TABLES

FACTS ABOUT THE GREAT LAKES	407
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Numerous other lists and tables in the fields of geography, history, literature, science, mathematics, and other departments of knowledge will be found with their appropriate articles in the main text

EDITOR'S NOTE

EVERY user of Compton's Pictured Encyclopedia should form the habit of *first* turning to the Fact-Index section at the end of each volume when in search of specific information. This index is a miniature work of reference in itself and will often give you directly the facts, dates, or definitions you seek. Even when you want full treatment of a subject, you will usually save time by finding in the index the exact page numbers for the desired material.

All page numbers are preceded by a letter of the alphabet, as A-23. The letter indicates the volume. If two or three page numbers are given for the topic you are seeking, the first indicates the more general and important treatment; the second and third point to additional information on other pages. Where necessary, subheadings follow the entry and tell you by guide words or phrases where the various aspects of the subject are treated.

The arrangement of subheadings is alphabetical, except in major historical and biographical entries. In these the chronological order is followed.

The pictures illustrating a specific subject as a rule appear on the same pages as the text to which you are referred. But often illustrations placed elsewhere will prove of additional interest and value. These are indicated by the word *picture* followed by a page number.

A picture reference is frequently intended to call attention to details in the text under the illustration as well as to the illustration itself. This picture-text, therefore, should always be carefully read.

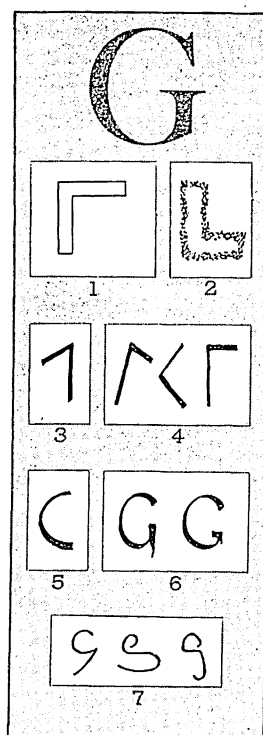
The pronunciations given are those preferred by the best and most recent authorities; alternative pronunciations are indicated only where usage is equally divided. For foreign names the native pronunciation is given except where the English pronunciation has become thoroughly established, as in "Paris," "Barcelona," "Seine."

In recent years hundreds of foreign geographical names have been changed, either officially or by custom. Both old and new names are given at the appropriate places in the alphabet.

Populations are given in round numbers, except for places in the United States and Canada, where the figures are those of the latest official census. Distances between points are map or air distances, not distances by railroad.

THE EASY REFERENCE FACT-INDEX

Reg. U. S. Pat. Off.



OUR LETTER G probably started in ancient Egypt as a sign for an angle in a wall (1). Shortly after 2000 B.C., a Semitic people called the Seirites adopted it as an alphabetic sign for the hard sound of 'g' (as in 'gay'), because to them the sign looked like a carpenter's square, and their name *gimel* for 'a square' began with this sound.

These people used a crudely made square (2) for the letter. The later Canaanite-Phoenician writing gave the sign a simple form (3) suited to writing in Semitic fashion from right to left. In Hebrew the sign was called *gimel*, and other Semitic languages had similar names. In all these alphabets, the letter had the third place, after A and B.

The Greeks took both the angular form and the pronunciation of the Phoenician letter into their writing; but they changed the name to *gamma*, and gradually they gave the letter a more pleasing appearance (4).

When the Romans took over the Greek alphabet, they gave the sign a rounded shape and turned the opening to the right (5). But for a time they used it for the same sound as 'k'. Thus they had two signs for one sound, and none for the hard 'g'. To remedy this lack, they gave the C sign a tail, and this made a G (6). They also made it the seventh letter of the alphabet, in the old place of the Greek Z, which they were not using at this time.

The capital letter came from Latin into English without change; but after the Norman conquest of England, the English adopted the French practise of pronouncing a soft *g* (as in 'gem') before *e*, *i*, and *y*, in words of French, Latin, and Greek origin ('ginger', 'gymnasium').

Our handwritten small 'g' was developed from the capital by using a loop at the bottom for speedy writing (7). Our printed small 'g' is a form of the handwritten one.

NOTE.—For the story of how alphabetic writing began and developed, see the articles Alphabet; Writing.

G-1, G-2, G-3, G-4, G-5, divisions of a military staff U-224

Gabardine (*gāb-ēr-dēn'*), the gown or cloak which Jews were compelled to wear in the Middle Ages; also a twilled cotton or worsted fabric having a raised cord on one side.

Gabbro, an igneous rock M-184

Gabelle (*gā-bēl'*), in old English and European law a tax, excise, impost, or duty; in French history a salt tax, abolished 1790: F-200

Gabers. See in Index Ghebers

Gabii (*gā'bi-i*), ancient city of Latium, 12 mi. e. of Rome; captured by Tarquinius Superbus; excavations have yielded notable works of art 'Artemis of Gabii', picture E-333

Gabin'ius, Aulus (died 47? B.C.), Roman politician; as tribune 66 B.C. established Gabinian law which gave Pompey command in Mediterranean; consul 58 B.C.; proconsul in Syria 55 B.C.; banished for extortion though defended by Cicero, whom he had exiled while consul.

Gable, in architecture A-271, A-168

Gabon, colony in s. w. French Equatorial Africa; about 93,000 sq. mi.; pop. 410,000; cap. Libreville: map A-42a

Gaboriau (*gā-bō-rē-ō'*), Emile (1835-73), French writer of detective stories; among the best are 'Monsieur Lecoq', 'The Slaves of Paris', 'Other People's Money'.

Gabriel (*gā'bri-ēl*), archangel and heavenly messenger, sent to the Virgin Mary (Luke i, 19, 26), the prophet Daniel and others; recognized by Mohammedans as well as Christians and Jews; commemorated as saint in Roman Catholic church March 24

character in 'Paradise Lost' M-180

Gabrilowitsch (*gāb-rēl-ōv'ich*), Ossip (1878-1936), Russian-American pianist and conductor, born St. Petersburg (Leningrad), Russia; pupil of Rubinstein and Leschetizky; married Clara Clemens, daughter of 'Mark Twain'; conductor Detroit Symphony Orchestra 1918-36.

Gad, son of Jacob; ancestor of tribe of Gad.

Gadames, Libya. See in Index Ghadames

Gaddi (*gād'dē*), family of Florentine painters, of whom most important was Taddeo (1300?-66); he was most talented pupil of Giotto; said to have continued Giotto's work on Florence campanile and to have built the Ponte Vecchio.

Gade (*gād'dū*), Niels Wilhelm (1817-90), leading Danish Romanticist composer; his music is lyrical and highly polished; wrote symphonies, overtures, suites, and songs ('Erl King's Daughter', 'The Springtide Phantasy', 'The Crusaders').

Gadfly. See in Index Horse-fly

"Gadfly of Athens," nickname of Socrates S-188

Gadir, ancient name of Cadiz, Spain S-228

Gadolin (*gād'ō-lin*), Johan (1760-1852), Finnish chemist, discoverer of yttrium.

Gadolin'ium, a chemical element, table C-168

Gads'den, James (1788-1858), American diplomat, born Charleston, S. C.; as minister to Mexico, negotiated Gadsden Purchase (1853).

Gadsden, Ala., manufacturing city on Coosa River 56 mi. n.e. of Birmingham near Lookout Mt.; pop. 36,975; coal and iron and timber region;

iron and steel, cotton, tires, and lumber products: map A-98

Gadsden flag F-98, color plate F-90

Gadsden Purchase, territory s. of Gila River in Arizona and New Mexico, bought by U. S. from Mexico in 1853: U-241-2, map U-242

Gad's Hill, home of Dickens D-67a

Gadski (*gāt'skē*), Johanna (Madame Hans Tauscher) (1871-1932), German soprano, great Wagnerian interpreter; member Metropolitan Opera Company 1898-1917.

Gadwall, or gray duck, a freshwater duck (*Chaulelasmus streperus*); general color dark gray, brownish on back; white markings give plumage a beautifully scaled appearance: picture D-117

Gaea (*gē'a*), or Ge, in Greek mythology the ancient goddess "Mother Earth" U-261

intercedes for Daphne D-14

Gaelic (*gāl'ik*), ancient language of Ireland and Scotland I-131, 132

Gaelic League, in Ireland I-132

Gaels (*gālz*), ancient Celtic peoples of Ireland and Scotland, who spoke Gaelic language: I-130

Gaeta (*gā-ā'tā*), Italy, strongly fortified seaport 45 mi. n.w. of Naples; refuge of Pope Pius IX. when he fled (1848-50) from Rome; Francis II of Naples surrendered to Garibaldi 1861 after long siege: map I-156

Gaff, a spar for extending the upper edge of a stayless fore-and-aft sail and the lower edge of a gaff top-sail, pictures B-164, S-119

Gag (*gāg*), Wanda (born 1898), American artist and author, born New Ulm, Minn. of Bohemian parents; writer and illustrator of children's books ('Millions of Cats';

- 'The A. B. C. Bunny'; 'Gone Is Gone'; 'Growing Pains', story of how she grew up).
- Gage, Lyman J. (1836-1927), American financier; born De Ruyter, N. Y.; secretary of treasury 1897-1902; president U. S. Trust Co., N. Y., 1902-06; a leader of Middle West banking interests; president board of directors, World's Columbian Exposition, Chicago.
- Gage, Thomas (1721-87), British general, governor of Massachusetts and military commander in chief in America at outbreak of American Revolution; entered army 1741; went to America, under General Braddock, 1754; with Braddock when he was defeated by Indians, 1755; superseded by Howe after Bunker Hill.
- Lexington and Concord L-100
- Gage, measurement. *See in Index*
- Gauge
- Gage plum P-260
- Gag resolution, certain rules passed by Congress in 1835 and 1837, which provided that all petitions relating to abolition of slavery should virtually be disregarded and should be laid on the table without action C-250
- John Quincy Adams opposes A-15-16
- Gaheris (*gä'her-is*), Sir, knight of the Round Table R-160
- Gahn (*gän*), Johan Gottlieb (1745-1818), Swedish chemist and mining engineer, first to isolate pure manganese.
- Gaillard (*gä-yär'*), Château, castle of Richard the Lion-Hearted R-104
- Gaillard (*gä'länd*), David (1849-1913), American army officer and engineer, born Sumter County, South Carolina; after 1908 in charge of construction of Panama Canal between Gatun and Pedro Miguel.
- Gaillard Cut (formerly known as the Culebra Cut), section of Panama Canal P-53, *pictures* P-43, 44
- Gaillardia (*gä-lär'äi-ä*), a genus of annual and perennial herbs of the composite family with showy yellow, orange, or red flower heads; native to w. North America; also called blanket-flower
- how to plant G-10
- Gaines' Mill, battle of, took place in McClellan's campaign 1862, on Chickahominy River 9 mi. n.e. of Richmond, Va.; it was second of the Seven Days' battles.
- Gainesville, Fla., winter resort 65 mi. s.w. of Jacksonville; pop. 13,757; University of Florida: *map* F-112
- Gainsborough (*gänz'bör-ö*), Thomas (1727-88), one of greatest English portrait painters; father of naturalistic landscape in England; notable works include 'The Blue Boy', now in Huntington Art Gallery, San Marino, Calif., and 'Duchess of Devonshire', in National Gallery of Art (Mellon Collection), Washington, D. C.
- Gai'serie. *See in Index* Genseric
- Galactose, a simple (monosaccharide) sugar (C₆H₁₂O₆), occurring in the brain and nerves; not found in nature and obtained by reduction of milk sugar (lactose).
- Galahad (*gäl'ä-häd*), hero of Arthurian legends G-1, *pictures* A-315, 316, K-30a-b
- symbolizes ideal of purity P-370
- Galalith, a synthetic plastic P-246
- Galápagos (*gä-lä'pá-gös*) Islands (official name Archipelago of Colón), also called Tortoise Islands
- from Spanish *gala'pagos*, or "tortoise"; group of islands belonging to Ecuador; largest are Albemarle, Indefatigable, Chatham, James, and Charles; export salt, lizard skins; 2400 sq. mi.; pop. 2000; became U.S. army base for defense of Panama Canal, 1942: E-154, S-2081, *map*, inset S-208b
- Darwin's discoveries D-16
- iguana I-11
- lava field, *picture* S-205e
- national park N-23
- Galata (*gäl'lä-tä*), seaport, and suburb of Istanbul, on Golden Horn: shipping and trading: *map* I-152
- Galatea (*gäl-ä-té-ä*), in mythology statue made by the sculptor Pygmalion and endowed with life by Venus in answer to his prayer; also, nymph in various legends.
- Galati, Rumania. *See in Index* Galatz
- Galatia (*gä-lä'shi-ä*), ancient country in central Asia Minor
- Celts found kingdom C-124
- Gala'tians, Epistle to the, 9th book of the New Testament, written by the Apostle Paul to the Galatian churches about 56 A.D.
- Galatz (*gä-läts'*), or Galati, Rumania, important Danube port in e.; pop. 100,000: D-14, *map* B-154
- Galaxy, in astronomy A-345-6
- Milky Way S-273, *chart* S-275
- nebulae as forerunners N-61
- solar system A-345-6
- Galba (*gäl'bä*), Servius Sulpicius (5 B.C.-69 A.D.), Roman emperor for seven months
- Nero overthrown by N-64
- Galdhøppigen, peak in s. Norway, highest in Scandinavia (8399 ft.).
- Galdos (*gäl-dös'*), Benito Pérez. *See in Index* Pérez
- Gale, Zona (1874-1938), American writer, born Portage, Wis.; married William L. Brees; first wrote sentimental stories ('Loves of Pelleas and Ettarre'; 'Friendship Village'); later, realistic novels depicting small town life with fidelity and humor ('Birth'; 'Faint Perfume'; 'Preface to a Life'; 'Miss Lulu Bett'—last dramatized, and awarded Pulitzer prize 1921): A-181
- Gale, a strong wind S-298, W-113
- Galen, Claudius (130?-200? A.D.), Greek physician, celebrated ancient medical writer whose some 500 treatises (of which only about 80 now exist in print) were long accepted as authority
- theory of blood circulation B-158
- Gale'na, Ill., lead and zinc mining city in extreme n.w. of state; named for deposits of galena ore in vicinity; pop. 4126
- Grant's home G-132
- origin of name L-76
- settlement I-18
- Galena, Kan., city in Cherokee County, in extreme s.e. Kansas; named for deposits of galena ore in vicinity; pop. 4375.
- Galena (lead sulphide), one of the most common ores of lead L-76
- used in early radio sets R-20
- Gale'rius (Galerius Valerius Maximianus), Roman emperor 305-311; rose from common soldier to be Diocletian's son-in-law and successor
- gives Christians freedom of worship C-232
- relations with Constantine C-346
- Galesburg, Ill., manufacturing city 40 mi. n.e. of Burlington, Iowa; pop. 28,876; railroad shops; packed meats, bricks, farm machinery; Knox College: *map* I-13
- Galicia (*gä-lish'i-ä*), also Galicja, Poland, agricultural district on n. slopes of Carpathians; 30,000 sq. mi.; pop. 8,258,000; former Austrian crownland, important in 1st World War: A-380-1, W-155, 159-60
- Galicia, Spain, district in n.w. corner, formerly kingdom; inhabitants, Gallegos, resemble Portuguese; chief city, Coruña: *map* S-226
- Gal'ilee (Hebrew *border* or *ring*), Roman province in n. Palestine; land of Christ's boyhood and chief center of his active work: P-34-5
- Galilee, or Gennes'aret, Sea of, large pear-shaped lake in n. Palestine traversed by Jordan River; 64 sq. mi.; frequented by Christ and disciples; also called Tiberias and Kinneret (or Chinnereth): *pictures* A-326, P-35
- Galileo (*gäl-i-lé'ö*) (1564-1642), great Italian mathematician, physicist, and astronomer G-1-2
- attempt to measure speed of light L-127
- contributions to physics P-196
- discoveries with telescope T-38, *picture* A-343
- discovers laws of falling bodies G-142, *picture* G-143
- pendulum discovery P-108
- thermometer T-79
- Gall, or Gallus, Saint (died 640? A.D.), Irish monk and missionary to European continent; founded monastery of St. Gall, Switzerland.
- Gall (Indian name *Pizi*) (1840-94), Sioux chief; in 1868 refused to go to reservations, and in 1876 was chief leader in battle of Little Big Horn when Custer was killed; after 1889 judge of the Court of Indian Affairs at Standing Rock Agency.
- Gall (*gäl*), Francis Joseph (1758-1828), German anatomist, founder of phrenology P-186
- Gall, a swelling on plants caused by parasites. *See in Index* Galls
- Galland (*gä-län'*), Antoine (1646-1717), French orientalist, first European translator of 'Arabian Nights'; professor of Arabic at Collège de France: A-244
- Gallas, powerful and most numerous of Hamitic peoples of East Africa and Abyssinia: E-308
- Gal'atin, Albert (1761-1849), American economist and statesman born Geneva, Switzerland, one of greatest of financiers; U. S. representative 1795-1801; as secretary of treasury under Jefferson and Madison systematized government's finances; led negotiations for Treaty of Ghent (1815); minister to France 1816-23; minister to England 1826; notable researches in life and history of American Indian; founded American Ethnological Society of New York 1842; helped found New York University.
- Gallatin River, Mont., flows n. 170 mi. from Yellowstone National Park, for 70 mi. through steep and picturesque canyon, to Missouri River: *map* M-243
- Gallaudet (*gäl-a-dét'*), Thomas H. (1787-1851), American educator, born Philadelphia, Pa., founder of first deaf-mute institution in America: D-22
- Gallaudet College, for deaf, at Washington, D. C. D-22, W-27. *See also in Index* Columbia Institution
- Gall-bladder L-165
- Galle (*gäl'lü*), Johann Gottfried (1812-1910), German astronomer, discoverer of 3 comets; first to observe the planet Neptune: A-350

Key—cäpe, ät, fär, fäst, whät, gäl; mä, yët, fërn, there; ice, bit; rōw, wōn, fōr, nōt, dō; cūre, büt, rŷde, fŷll, bŷrn:

Galle (*gāl*), also Point de Galle, a port of Ceylon on s.w. coast; seized by Portuguese in 1518; fortified by Dutch in 1642; British since 1796; former center of spice trade; pop. 38,000: *map* A-332c

Gallegos (*gāl-yā'gōs*), inhabitants of the district of Galicia, Spain; resemble Portuguese.

Galleon (*gāl'e-on*) (derived from galley), a three- or four-decked sailing vessel of 15th to 17th century, with lofty "castles" at bow and stern, *picture* S-125

Spanish Armada A-301

Galleria Vittorio Emanuele, at Milan M-169

Gal'ley, in printing, an oblong steel tray for type that has been set.

Galley, ship propelled wholly or partly by oars

early development S-117

Greek and Roman N-56d, *picture* S-159

Middle Ages S-118

Phoenician S-117-18, *picture* S-125

Spanish Armada A-301

Galley-slaves, *picture* S-159

Gall-fly O-190, I-79

Gall gnats, the family *Itonididae*, which includes the Hessian fly; damage crops.

Gal'lia. *See in Index* Gaul

Galliard (*gāl'yērd*), lively 16th-century Italian dance in triple time, popular especially in England.

Galli-Curci (*gāl'lē-kgr'chē*), Amelita (Mrs. Homer Samuels) (born 1889), Italian-American coloratura soprano; born Milan, Italy, of Italian-Spanish parentage; studied piano in Royal Conservatory, Milan, and taught there; was practically self-taught in voice; sang with Chicago and Metropolitan opera companies; famous rôles, Dinorah, Lucia, Juliet, Gilda in 'Rigoletto'.

Gallieni (*gāl-yā-nē*), Joseph (1849-1916), French general and colonial administrator, conqueror and pacificator of Madagascar (1896-1905), military governor of Paris (1914-15) at first battle of Marne W-154, M-67, *map* M-66

Galliformes (*gāl'i-fōr'mēz*), an order of fowl-like, ground-dwelling birds, including guans, grouse, quails, pheasants, turkeys, and domestic chickens.

Gallinule (*gāl'i-nūl*), water bird resembling coot and rail in habits, and like them called mud-hen R-35

Gal'lio, Lucius Junius Annaeus (first century A.D.), older brother of Seneca, Roman pro-consul of Achaëa (53 A.D.) who "cared for none of these things" when Jews hailed the Apostle Paul before him. "Careless Galileo" has become a synonym for an indifferent person.

Gallipoli (*gā-līp'ō-lē*), Turkish Geli-bolu (*gē-lē'bō-lu*), port on Gallipoli Peninsula, Turkey; key to Dardanelles; former Turkish naval station; first European possession of Turks, taken in 1353: *map* B-18

Gallipoli Peninsula (ancient Chersonesus), separating the Dardanelles on e. from Gulf of Saros on w. 55 mi. long, 4 to 13 mi. wide; seized by Ottoman Turks in 1353

1st World War W-157, T-164, *map* B-18

Gallitzin, Demetrius (1770-1840), Roman Catholic missionary, born The Hague; son of Russian prince; came to America 1792 and ordained priest in Baltimore 1795; founded a colony at Loretto in s.w. Penn-

sylvania (1799) and labored there 41 years, spending his fortune on the welfare of the settlement.

Gallium, chemical element C-176, *table* C-168

Gall-mites S-258

Gall-nut. *See in Index* Galls

Gal'lon, a unit of measure, *table* W-67

Galloway, Joseph (1731-1803), American lawyer, born West River, Md.; tried to effect compromise between Colonies and Great Britain; joined British army when war was declared: R-86

Gal'loway, former division of s.w. Scotland, comprising counties of Kirkcudbright and Wigtown, famous for breeds of horses and cattle; the Bruces were lords of Galloway.

Gal'loway, breed of beef cattle C-105

Galloyak, hybrid animal C-105

Galls, abnormal growths on leaves, stems, buds, flowers, or roots caused by various parasites—especially insects and mites, and more rarely by nematodes, bacteria, fungi, slime molds, and algae; found on almost all forms of plant life, but especially common on oak trees, willows, roses and goldenrod

oak galls, or gall-nuts O-190: ink from I-79; tanning leather L-84

work of mites S-258

Gallup, George Horace (born 1901), statistician, born Jefferson, Iowa; professor of journalism at Columbia University; in 1935 founded American Institute of Public Opinion (The Gallup Poll) for measuring public opinion on specific questions. *See also in Index* Institute of Public opinion

Gallup, N. Mex., city 150 mi. w. of Santa Fe in coal-mining district; trading point for Navajo reservation; annual inter-tribal Indian ceremonial held here; pop. 7041: *map* N-97

Gallus, Saint. *See in Index* Gall, Saint

Galsworthy, John (1867-1933), English novelist and dramatist, born in Surrey, England; graduated from New College, Oxford; called to bar but practised only a short time; after a period of traveling turned to writing; most of his novels and plays deal with social or economic problems; won Nobel prize in literature 1932: *picture* E-288. *See also in Index* Forsyte Saga

Galt, Ontario, industrial center on Grand River about 55 mi. s.w. of Toronto; pop. 14,006; boilers, engines, textiles, brass goods, shoes, lumber, safes: *map*, inset C-50b

Galt, John (1779-1839), Canadian colonizer and novelist, born Irvine, Ayrshire, Scotland; 1824-29 was promoter of the Canada Company; also known for his novels of Scottish life.

Galt, Ontario, industrial center on Grand River about 55 mi. s.w. of Toronto; pop. 14,006; boilers, engines, textiles, brass goods, shoes, lumber, safes: *map*, inset C-50b

Galtier (*gāl't-yā*), Lucian (1811-66), French missionary priest gave name to St. Paul, Minn. S-11

Gal'ton, Sir Francis (1822-1911), English anthropologist and meteorologist, noted student of heredity; cousin of Charles Darwin; made first attempt to chart weather on extensive scale and propounded anti-cyclone theory

biometry founded by B-118

contributions to psychology P-362

eugenics E-315

finger-prints, study of F-43

quoted on Athenian culture G-158

theory of heredity H-283

Galtonia (*gāl-tō'ni-ā*), or summer

hyacinth, a genus of plants of lily

family, native to S. Africa; flowers

on long scape (stem), fragrant,

white or tinged green, bell-shaped:

one species, *G. candicans* often

listed as *Hyacinthus candicans*.

Galuppi (*gā-lup'pē*), Baldassare

(1706-85), Italian composer, called

'Il Buranello' from his birthplace

the Island of Burano, near Venice;

noted harpsichord player; comic

operas enjoyed great popularity;

also wrote sacred music. Brown-

ing's 'A Toccata of Galuppi' refers

to an imaginary extemporization

by the composer.

Galvani (*gāl-vā'nē*), Luigi (1737-98),

Italian anatomist, discoverer of

electric phenomena called galva-

nism E-232, *picture* E-231

Galvanic cell, or voltaic cell E-232,

E-214. *See also in Index* Electric

battery and cell

Galvanism, term formerly used for

current electricity E-232

Galvanized iron, iron coated with zinc

to prevent rust Z-217, E-237

named for Galvani E-232

Galvanometer, device for measuring

amount or strength of electric cur-

rent G-2-3

mirror device in cabling C-5

named for Galvani E-232

pyrometer employs P-373

Wheatstone Bridge, *picture* E-224

Galveston, Tex., one of greatest cot-

ton-exporting ports in world; pop.

60,862: G-3, *map* T-56

government M-302

harbor G-3, H-216, *picture* G-3

level raised D-105

medical school T-59

Galvez (*gāl-vā'h*), José de (1729-

86), Spanish statesman; important

influence in colonizing of American

Southwest: S-222-3

Galway (*gāl'wā*), largest county of

Connaught province, Ireland, in

middle of w. coast (area 2293 sq.

mi., pop. about 170,000); also sea-

port (pop. 18,000) at head of Gal-

way Bay: *maps* E-270a, 279

Galway Bay, on west coast of Ire-

land; reaches 30 mi. inland between

Galway and Clare counties: *maps*

E-270a, 279

Gama (*gā'mā*), Vasco da (1460?-

1524), Portuguese navigator and

explorer G-3-4

Mozambique M-294

results of explorations I-38, P-314

Gamagrass, or sesame-grass, a genus

of coarse, drough-resisting grass

(*Tripsacum*) from 1 to 8 feet high;

cultivated for fodder in southern

United States and Mexico.

Gamaliel (*gā-mā'li-ēl*), a learned

Pharisee, Paul's instructor in law

(Acts xxii, 3); advocate in the

Sanhedrin of moderate treatment

of the Christian apostles (Acts v,

34-9).

Gambarelli, Antonio (1427-79), com-

monly called Rossellino, Italian

sculptor; work influenced by Dona-

tello: S-57

Gambella, also Gambela, a trade

center in w. Ethiopia, leased to the

government of Anglo-Egyptian

Sudan E-308

Gambet'ta, Léon (1838-82), French

statesman and orator, anti-im-

Republican leader during and after Franco-Prussian War; premier in 1881
 siege of Paris F-188
Gamb'ia, British colony and protectorate in w. Africa on both sides of lower Gambia River; 4070 sq. mi.; pop. 200,000; cap. Bathurst: map A-42a
Gambia River, flows n.w. 1000 mi. through French Senegal and British Gambia into Atlantic at Bathurst; navigable for about 350 mi.
Gambier (*gām'bēr*), the product of a vine (*Ouropouria gambir*) of the madder family, cultivated in Singapore and the Malay Archipelago; used for tanning and dyeing.
Gamboge (*gām'bōg'*), a gum-resin R-78
Gambrel roof A-168, A-271
Gambusia, or top minnow, small swamp-fish (*Gambusia affinis*), of the minnow family
 enemy of the mosquito M-270
Game Laws, statutes enacted for protection of game from destruction, or for safeguarding sporting privileges
 protection of birds in U.S. B-145c-46, B-123
Gam'elin, Maurice Gustave (born 1872), French general, born Paris; made general during 1st World War, chief of general staff 1931, and commander in chief of Allied armies in France 1939-40; relieved of post and held for trial for "war guilt."
Game preserves, wild life refuges C-343. See also in Index Birds, subhead protection
 African big game country A-36d
 Fish and Wildlife Service U-230
Games. See also in Index Athletics; Play and games; Sports
 bibliography H-313c
 billiards B-108-9
 bowling B-207
 cards, playing C-83-4
 charades C-143-4
 checkers C-163-4
 chess C-182-4
 children's games P-247-57
 croquet C-402
 etiquette, good sportsmanship E-312b
 Olympic games: ancient O-224-5; modern A-356
 roque C-402
Gamete (*gām'ēt*), a reproductive cell H-284, pictograph H-283b, pictures H-285
Gametophyte (*gām'ē-tō-fit*), the stage in the life history of most plants during which the sex organs are produced; also the sexual plant itself. See also in Index Alternation of generations
 ferns F-26
Gamma rays, of radium R-32, R-14, 15
 penetrating power R-33
'Gammer Gurton's Needle', an old English comedy first acted in 1566; probably written by William Stevenson; action hinges on Gammer Gurton's loss of her needle.
Gamolepis (*gā-mōl'ē-pis*), an annual plant (*Gamolepis tagetes*) of composite family, native to S. Africa. Wiry, low-growing, covered with yellow or orange daisy-like flowers; leaves deep green, feathery; used in rock gardens.
Gamopetalous plants, a division of the angiosperms T-137
Gamp, Mrs. Sarah, an unprofessional nurse in Charles Dickens' novel 'Martin Chuzzlewit', who is always ready to hire herself out in many capacities for which she is unfitted.

Gananoque (*gān-ā-nōk'* or *gān-ā-nōk'wē*), Ontario, manufacturing town and favorite summer resort 18 mi. n.e. Kingston; pop. 3592.
Ganapati (*gā-nū-pā'tē*), Hindu god. See in Index Ganesa
Gand. See in Index Ghent
Gander, male goose G-120
Gandhi (*gān'dē*), Mohandas Karamchand (born 1869), leader of India's movement to secure home rule G-4-5, I-40
Ganelon (*gān-lōn'*), officer or knight of Charlemagne, who in jealousy of Roland betrayed Charlemagne and plotted the battle of Roncesvalles in which Roland was killed; name has since stood for treachery.
Gane'sa, Gane'sha, or Ganapat'i (Sanskrit "lord of the host"), Hindu god of wisdom and remover of obstacles; chief of the minor deities who attend Siva; represented as elephant-headed: picture A-329
Ganges (*gān'gēs*) River, India, sacred river of the Hindus, rises in Himalaya Mts., flows 1540 mi. into Bay of Bengal G-5, maps I-30, A-332b-c
 Benares B-95, pictures B-95, I-29
 tidal wave T-81
 valley, population I-31
Ganglion, a mass of nerve cells that serves as a center of nervous influence P-207
Gang plow F-259
Ganivet (*gā-nē-vēt'*), Angel (1865-98), Spanish writer; urged strengthening of national will-power ('Idearium español'); also wrote philosophical novels ('La conquista del reino de Maya'): S-237
Gan'net, or solan goose, a large sea bird (*Sula bassana*) of the gannet and booby family (*Sulidae*); entire plumage white, except for black primaries; bill long, pointed, and slaty-blue; feet greenish-black: G-5
 frigatebird robs F-206
Gannett Peak, Wyoming, in Wind River Mts.; highest point in state, 13,785 ft.
Gan'oids, a sub-class of fish with bony plates instead of scales F-68
 evolution F-73
Ganymede (*gān'i-mēd*), in Greek mythology, beautiful youth carried off to be cupbearer of Zeus G-5
Ganz (*gānts*), Rudolf (born 1877), Swiss-American pianist, conductor, and composer; born in Zurich, came to U. S. 1900; director of St. Louis Symphony Orchestra 1921-27; director Chicago Musical College; orchestra and piano compositions, and many songs.
Gaplek meal, a cattle food T-10
Gapon (*gā-pōn'*), Father George (1870?-1906), Russian priest, revolutionary and government spy; led strikers' march to Winter Palace on Red Sunday (Jan. 22, 1905); believed murdered by revolutionaries he had betrayed.
G. A. R. (Grand Army of the Republic), a society of Civil War veterans organized at Decatur, Ill., in 1866 P-89
Gar, name given two different kinds of fishes; one, a ganoid (*Lepidosteus*) including the gar pike, a river and lake fish; the other a warm-sea, edible fish (*Belone*). Both are long, slender, round-bodied with jaws prolonged into a stout bill.
Garage (*gā-rāzh'* or *gār'aj*), a place for storing and caring for motor vehicles; word adopted from the French
 danger from carbon monoxide C-82

Garakonthie, Daniel (1600?-76), Onondaga Iroquois chief; friendly to French from time he lived with them as treaty hostage (1654); rescued 60 white captives from hostile tribes; converted to Catholicism 1669.
Garamond, Claude, French printer of 16th century, originated fine type designs: T-174, picture B-177
Garand (*gā-rānd'*), John C. (born 1889), inventor of the Garand semi-automatic rifle adopted by U. S. Army in January 1936; born in Canada, he became a U. S. citizen in 1920; a toolmaker, he entered U. S. government service in 1918, was transferred to Springfield (Mass.) Arsenal in 1919.
Garand rifle M-6, pictures F-51, C-337
Garbage collection, in cities C-241
Garber, Daniel (born 1880), American painter, born North Manchester, Ind.; interested in the problems of painting light; decorative and well composed landscapes glow with sunlight.
Garbo, Greta (born 1906), motion picture actress, born Stockholm, Sweden; educated Royal Dramatic Academy, Stockholm; won fame in U. S. in 'Queen Christina', 'Anna Karenina', 'Camille', 'Ninotchka'.
Garborg (*gār-bōr'*), Arne Evensen (1851-1924), Norwegian novelist and lyric poet; identified with movement for creating new literary language based upon peasant dialect derived from Old Norsk; novels show deep religious feeling ('Men'; 'Peace').
Garcés (*gār-ihās'*), Francisco (1738-81), Spanish missionary (Franciscan) and explorer; founded two missions on Colorado River and was killed by Yuma Indians there
 Nevada history N-78
 trail in Southwest S-223
García (*gār-sē'ā*, Spanish *gār-thē'ā*), Manuel (1805-1906), one of the most famous singing teachers of all time, son of Manuel Vicente García; for almost 50 years professor in Royal Academy of Music at London; continued private teaching until his death at age of 101; Jenny Lind was one of his pupils; he invented the laryngoscope.
García, Manuel Vicente (1775-1832), Spanish singer and teacher; father of Maria Malibran and Manuel García; theories laid groundwork of best modern teaching.
García Gutiérrez (*gā-tē-yā'rāth*), Antonio (1813-84), Spanish dramatist of romantic school.
García y Iñiguez (*gār-sē'ā ē ēn-yē-gās*), Calixto (1836-98), Cuban patriot, twice imprisoned in Spain. The essay by Elbert Hubbard, 'A Message to García', was inspired by the courage of Andrew S. Rowan in carrying message from United States to García, then commander of the rebel army, at opening of Spanish-American War.
Gar'da, Lake, also Benaco, largest lake of n. Italy, extending from Lombard plain into Tyrolean Alps, map I-156
Garden, Mary (born 1877), American operatic soprano, remarkable for dramatic impersonation ('Melisande', 'Salome', 'Louise'); director of Chicago Opera Company 1921-22 (first American woman impresario); born Aberdeen, Scotland: picture O-231
Garden City, N. Y., residential city on w. Long Island; pop. 11,223; book and magazine publishing center; near by are Mitchell Field, U. S.

Key—cāpe, āt, fār, fāst, whqt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dq; cūre, būt, rŷde, fŷll, bŷrn;

- Army aviation base, and Roosevelt Field airport: map L-195
- Gardenia**, a genus of evergreen trees and shrubs of the madder family native to the tropical and subtropical regions of the Old World; several species, notable for their fragrant white funnel- or salver-shaped blossoms, are cultivated in greenhouses and gardens; of these the Cape jasmine (*Gardenia Veitchii*) is one of the most beautiful; named for Alexander Garden (1730?-91), naturalist.
- Garden mint** M-195
- Garden of Gethsemane** (*gēth-sēm'a-nē*), e. of Jerusalem; scene of Christ's agony on night before crucifixion: J-212, 214, picture J-212
- Garden of the Gods**, Colo., near Colorado Springs C-312
- Gardens**, zoölogical Z-219-26. See also in *Index* Zoölogical gardens
- Gardens and gardening** G-6-13. See also in *Index* Fruits and fruit growing; Insect pests; also names of individual flowers, fruits, and vegetables
- bibliography H-313h
chemical gardening P-245f-i
fertilizers G-7, 9, P-27
floriculture G-6-12
flowers, lists G-10-11, 12, N-41
formal, pictures G-6, 7
hedges H-269-70, G-9
Japanese J-197
landscaping G-8-9, pictures G-6-9
lawn planting G-9
old-fashioned garden, chart G-12
plant pests and diseases G-11: cutworm C-418; insects I-89-90; weevils W-65
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sprays and spraying S-262-3
transplanting G-8
truck gardening G-6
vegetable raising G-6-8, table G-13
vines, list N-41
weeds W-64-5
'Wild Garden and Its Tenants', story N-38-9
winter protection G-12
- Garden spider** S-252
web, pictures S-253, 254
- Garden State**, popular name for New Jersey.
- Gardinas** (*gār'dē-nās*), Poland. See in *Index* Grodno
- Gardiner, Alan** (born 1879), English scholar, born Eltham, England; authority on Egyptian language ('Egyptian Grammar', 'Theory of Speech and Language'): A-135
- Gardiner, Samuel Rawson** (1829-1902), English historian ('History of England', careful, nonpartisan, and based on exhaustive study).
- Gardiner, Stephen** (1483?-1553), English bishop and statesman; succeeded Wolsey as bishop of Winchester; he was largely responsible for fall of Thomas Cromwell; lord chancellor 1553-55.
- Gardner, Mass.**, agricultural trade center, 23 mi. n.w. of Worcester; pop. 20,206; silverware, furniture, baby carriages, oil stoves.
- Gardner Island**, in Pacific. See in *Index* Phoenix Islands
- Gareth** (*gēr'eth*), Sir, knight of the Round Table R-160
- Garfield, James Abram** (1831-81), 20th president of U.S. G-14-15
Blaine secretary of state B-155
wife and family W-92
- Garfield, James R.** (born 1865), American lawyer and government official, born Hiram, Ohio; son of President Garfield; U.S. commissioner of corporations 1903-07; secretary of interior 1907-09; lawyer in Cleveland, Ohio, after 1909.
- Garfield, Lucretia Rudolph** (1833-1918), wife of President Garfield W-92
- Garfield, N.J.**, city on Passaic River 10 mi. n.w. of New York City; pop. 28,044; textiles, embroidery, chemicals, rubber goods, machinery.
- Garfield Heights**, Ohio, residential and industrial suburb of Cleveland; pop. 16,989.
- Gargano** (*gār-gā'nō*), mountainous peninsula of s. Italy extending about 30 mi. into Adriatic.
- Gargantua** (*gār-gān'tū-ā*), giant hero of Rabelais' satire of that name, whose "Gargantuan" appetite is proverbial R-9
- Gargoyle** (*gār'gōil*), in architectural decoration A-269, picture P-71
- Garibaldi** (*gā-rē-bāl'dē*), Giuseppe (1807-82), Italian national hero G-15
birthday celebrated H-322
meets Victor Emmanuel, picture I-157
part in Italy's unification I-157-8
- Garibaldi**, a fish (*Hypsypops rubicunda*), most frequently seen through the famous glass-bottom boats at Catalina Island; nearly a foot long; when full grown is pure bright scarlet; abundant in the coral reefs of the tropics.
- 'Garibaldi Hymn', patriotic song of Italy N-25
- Garland, Hamlin** (1860-1940), American writer, born West Salem, Wis.; noted for vigorous portrayal of mid-western life with strong local color ('Main-Travelled Roads', short-stories; 'Son of the Middle Border', 'Daughter of the Middle Border', 'Back-Trailers from Middle Border'): picture A-180
- Garlic** O-225
elephant type, picture B-277
- Garneau** (*gār-nō*'), Alfred (1836-1904), French-Canadian poet, born Quebec; son of François X. Garneau; verses marked by sensitiveness and fineness of form ('Poésies').
- Garneau, François Xavier** (1809-66), Canadian historian and writer; born Quebec; his 'Histoire du Canada' a standard historical work.
- Garner, John Nance** (born 1869), American political leader, born Red River County, Texas; congressman from Texas 1903-33; speaker of House 1931-33; vice-president of U. S. 1933-41.
- Garner, Richard Lynch** (1848-1920), American naturalist; studied apes in Africa; said chimpanzee has vocabulary of from 12 to 20 sounds.
- Gar'net**, semiprecious stone G-28, picture C-409
January birthstone G-25
- Gar'nett, David** (born 1892), English author, grandson of Richard Gar'nett; called "realist of the impossible" because of his beautiful fantasies ('Lady into Fox'; 'Go She Must'); also wrote 'No Love', modern novel, and 'Pocahontas', historical romance.
- Garnett, Edward** (1868-1937), English author and critic, son of Richard Garnett; literary adviser to many famous writers, including Conrad and Galsworthy; with his wife, translated many Russian works; wrote 'Tolstoy, His Life and Writings' and 'Turgenief, A Study'; edited 'Letters from Conrad' and 'Letters from John Galsworthy'.
- Garnett, Richard** (1835-1906), English librarian and author, keeper of the printed books in British Museum; wrote lives of Carlyle, Emerson, Milton; 'The Twilight of the Gods', a fanciful retelling of myths; with Gosse wrote history of English literature.
- Garnier, Charles** (1606-49), Canadian Jesuit missionary, born Paris, France; came to Canada 1636; murdered by Huron Indians.
- Garnishment**, in law, the process by which a judgment creditor seizes the money of his judgment debtor which is owed to, or held for, the debtor by a third person; garnishment proceedings usually involve salary or wages due from an employer, or money owed or held by a bank.
- Garonne** (*gā-rōn'*) River, chief river in s.w. France; rises in Spanish Pyrenees, flows n. into Bay of Biscay; length 357 mi.; F-173, maps F-179, E-326d
at Bordeaux B-194
Canal du Midi F-174
- Gar pike**, a river and lake fish with long, slender, rounded body F-68, P-218
- Gar'rick, David** (1717-79), British actor and manager, introduced a more natural style of acting; revived Shakespeare's plays in their original form; equally at home in tragedy or farce
member of famous club E-286
pupil of Dr. Johnson J-224
- Garrison, Theodosia** (Mrs. F. J. Faulks) (born 1874), American poet, born Newark, N.J. ('The Joy o' Life and Other Poems'; 'Earth Cry and Other Poems'; 'The Dreamers').
- Garrison, William Lloyd** (1805-79), American editor and leader of abolitionist movement G-16-17, C-249
friendship with Whittier W-96
woman suffrage movement W-132
- Garter**, Order of the D-35
meets at Windsor Castle W-114
- Gar'ner snake** S-172-3, picture S-172
- Garth, Caleb**, in George Eliot's 'Middlemarch' E-252
- Gar'vin, James Louis** (born 1868), English journalist and publicist, ardent imperialist, most powerful champion of Chamberlain's tariff reforms; editor of the London Observer, which he made a great organ of opinion, 1908-42.
- Gar'y, Elbert Henry** (1846-1927), American financier and promoter, born Wheaton, Ill.; chairman of finance committee and board of directors of U.S. Steel Corporation. Gary, Ind., named in his honor.
- Gary, Ind.**, world's greatest steel-producing center; at head of Lake Michigan, about 25 mi. from Chicago; pop. 111,719: G-17-18, I-48, map I-46
school system G-17-18
- Gas**, in chemistry and physics G-18, P-189, 190, 193
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air A-61-2, diagram A-63
Avogadro's law C-167a-b, G-18, picture C-166
balloons B-22, 24, 26, H-271, H-368
barometer measures pressure B-49-50, picture B-48
colloidal forms C-303
compressed G-18
gaseous chemical elements C-168
inert C-167b
ionization, how produced E-239

ü=French u, German ü; jem, jo, thin, then; ñ=French nasal (Jean); zh=French j (z in azure); κ=German guttural ch

laws of gases G-18
 liquefied G-18, L-155, A-7, H-271:
 Faraday discovers method F-12;
 increase electrical conductivity of
 metals H-260
 molecular activity G-18, H-261,
photograph H-258b
 poison gas P-275: carbon monoxide
 C-82; coal mines C-286; in warfare
 G-24-5, W-156, 157
 vacuum tubes use E-242-3
 Gas, for heating and lighting G-22-3,
 F-216. *See also in Index* Gas,
 natural
 acetylene A-7
 balloons use B-22
 Bunsen burner B-272-3
 by-products: alum A-137; ammonia
 A-188; coal-tar derivatives
 C-288-9; coke C-298
 coal gas G-22
 discovery and development G-22:
 Bunsen burner B-273
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 first American city using G-22
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 meters M-129
 natural gas G-23, 24. *See also in*
Index Gas, natural
 Pintsch gas G-23
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 producer gas G-23
 regulation of companies P-364
 storage tanks G-22
 stove G-23; burner, air supply B-273;
 cause of backfire F-46
 water gas G-23
 Gas, natural G-23-4, F-216
 a bitumen P-145
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 helium yielded H-271
 petroleum, associated with P-150
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 Louisiana L-206
 Ohio G-23, O-212
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 Pennsylvania G-23, P-114
 Texas T-54
 West Virginia W-77
 Gas black, a type of lampblack I-79.
See also in Index Lampblack
 Gasconade River, Missouri, rises in s.
 and flows n. 200 mi. to Missouri
 River, *map* M-208
 Gas'cony, former duchy in s.w.
 France; boundaries were Bay of
 Biscay, Garonne River, and the
 Pyrenees: *map* F-179
 acquired by Henry II H-275
 people F-172
 redemption of "Landes" S-22
 Gascony, Gulf of F-172
 Gascoyne River, in state of Western
 Australia; flows west into Shark
 Bay.
 Gas engine, or internal combustion en-
 gine G-19-22
 airplane A-74b, d, *picture* G-20
 airship arrangement B-24
 automobile A-396-8, I-116: first used
 A-388; lubrication A-404
 chemistry of explosion E-347-8
 development I-116, G-19-20
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 airplane, *picture* G-20; motor ship
 S-124; submarine S-311-12
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 four-cycle types G-20-21
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 pressure explained G-18

submarine S-311-12
 supercharger A-71
 turns heat into work H-263
 two-cycle types G-20
 Gas-filled electric lamps E-234
 Gas'kell, Elizabeth Stevenson (1810-
 65), English novelist; many of her
 books deal with poor workmen in
 Manchester ('Cranford', a delight-
 ful sketch of village life; 'Life of
 Charlotte Brontë').
 Gas laws, in physics P-193
 Gas mantle G-23
 cerium used in M-183
 Gas mask G-25
 adsorption by charcoal C-303
 use in coal mines C-286
 use in fumigating, *picture* E-145e
 Gas meter M-129
 Gasoline, a fuel liquid distilled from
 petroleum P-149-50, G-24
 alcohol blend A-112
 anti-knock gasoline P-150
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 sumption A-392
 coal product C-288
 cracking process P-149
 ethyl P-150
 gauge, in airplane A-76
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 natural, in Texas T-54
 natural gas supplies G-24
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 rationing N-12n-o
 synthetic P-149-50
 Gasoline gauge A-76
 Gasometer, gas storage tank G-22
 Gaspar (*gäs'pär*), one of the Wise
 Men of the East. *See in Index* Magi
 Gasparilla Carnival, Tampa, Fla. T-7
 Gasparri (*gäs-pär're*), Peter S. (1852-
 1934), Italian Roman Catholic car-
 dinal, secretary of state under Ben-
 edict XV; a noted authority on
 canon law, but best known for
 leading part he played in concordat
 between the papacy and Italy 1929.
 Gaspé (*gäs-pä'*), Philippe Aubert de
 (1786-1871), Canadian novelist,
 whose 'Les Anciens Canadiens'
 (The Old-Time Canadians) is de-
 tailed picture of seigniorial times.
 Gaspé, a district and peninsula in s.e.
 Quebec, projecting into Gulf of St.
 Lawrence, and consisting of an el-
 evated plateau traversed by Notre
 Dame Mts.; lumbering and fishing;
 visited by tourists because of scen-
 ery and picturesque villages; village
 of Gaspé scene of Cartier's landing
 in 1534: *map* C-50c, *picture* S-8
 Gaspee', British vessel burned by
 Rhode Islanders R-98
 Gaspereau, a fish. *See in Index* Ale-
 wife
 Gaspereaux (*gäs-prö'*), village in Nova
 Scotia, *picture* N-180
 Gasplant, an attractive perennial of
 genus *Dictamnus*, with large pin-
 nate leaves and tall purple or white
 racemes; native to Eurasia
 how to plant G-10
 Gas poisons P-275
 Gassendi (*gä-sän-dē'*), Pierre (1592-
 1655), French philosopher and
 mathematician; combined Epicu-
 rean philosophy with Catholic
 church doctrine (*Syntagma philos-
 ophicum*).
 Gasser, Herbert Spencer (born 1888),
 medical scientist and educator, born
 Platteville, Wis.; professor of
 pharmacology Washington Univer-
 sity, St. Louis, Mo. 1921-31, of
 physiology Cornell University
 School of Medicine 1931-35; di-
 rector Rockefeller Institute after 1935.
 Gas stove. *See in Index* Gas, for heat-
 ing and lighting

Gaston, Lucy Page (1860-1924),
 American reformer, born Dela-
 ware, Ohio; founded Anti-Cigarette
 League, 1899, at Chicago; worked
 in America and abroad for anti-
 cigarette legislation.
 Gasto'nia, N.C., textile manufacturing
 town 20 mi. w. of Charlotte, in rich
 agricultural region; pop. 21,313
map N-156
 Gastric juice S-292
 digestive action D-68-9
 hydrochloric acid in H-368
 lipase in E-299
 pepsin in P-120
 Gastropods, or stomach-footed mol-
 lusks, a class of mollusks including
 snails and slugs M-218-19
 Gastroscope, for examining the stom-
 ach
 light used E-234
 Gas warfare G-24-5
 Chemical Warfare Service, in U. S.
 Army, A-307a
 Hague Conference prohibits H-195
 World War, 1st W-156, 157
 Gas welding W-70
 Gat, Libya. *See in Index* Ghat
 Gateleg table A-170
 Gate of Judgment, Alhambra A-127
 "Gate of Tears." *See in Index* Bab el
 Mandeb
 Gate of the Giants, Shetland Islands
 S-116
 Gates, Eleanor (Mrs. Frederick F.
 Moore) (born 1875), American
 novelist and playwright, born Sha-
 kopee, Minn. ('The Biography of
 a Prairie Girl'; 'Cupid, the Cow-
 Punch'; 'The Poor Little Rich
 Girl', novel and play).
 Gates, Horatio (1728-1806), American
 general G-25
 battles of Saratoga S-28
 Conway Cabal R-87
 forsakes DeKalb at Camden D-39
 Gates, Sir Thomas (1559?-1621?),
 first sole governor of Virginia
 colony (1611-14); set sail from
 England 1609 in command of fleet
 carrying colonists to America; his
 ship the *Sea Venture* was wrecked
 on Bermudas, but two new vessels
 were built and reached Virginia
 1610.
 Gates'head, manufacturing town in
 n.e. England; pop. 123,000; opposite
 Newcastle on Tyne River; here De-
 foe wrote 'Robinson Crusoe'.
 Gates of the Rocky Mountains, gorge
 in Montana M-211
 Gateway of the South, name given
 Louisville, Ky. L-209
 Gath (*gäth*), ancient Philistine city
 on border of Judah in s.w. Pales-
 tine; birthplace of Goliath: P-170
 David at D-19
 Gatineau (*gä-tē-nō'*) River, in Canada,
 flowing s. 400 mi. into Ottawa River
 O-254
 Gat'ling, Richard Jordan (1818-1903),
 American inventor, born Hertford
 County, North Carolina; invented
 the revolving battery gun: M-6
 Gatling gun M-6
 Gattamelata (*gät-tä-mä-lä'tä*), cele-
 brated Italian soldier of the 15th
 century, leader of mercenaries
 statue by Donatello S-57
 Gatti-Casazza (*gät'tē kä-zät'sä*).
 Giulio (1869-1940), Italian operatic
 manager, director of La Scala,
 Milan, and from 1908 to 1935 di-
 rector of Metropolitan Opera Company,
 New York City.
 Gatty, Harold, American aviator
 round the world flight, *picture* A-72,
table A-74
 Gatun (*gä-tqn'*), town in Panama

Key—cäpe, ät, fär, fäst, whät, fäll; mä, yët, fërn, thäre; ice, bît; rōw, wón, fôr, nôt, dq; cüre, bü, ryde, füll, bürn;

Canal Zone; pop. 2477; also dam and artificial lake in Panama Canal: P-53, map P-52
 dam P-48, 53, table D-357
 locks P-52, pictures P-47
 Gatun Lake, Panama P-48, 53
 Gaucho (*gou'chô*), cowboy of Argentina A-279-80, 281, pictures A-280, S-206d
 monument, picture A-280d
 Gau'den, John (1605-62), English churchman and writer; reputed author of the celebrated 'Eikon Basilike'; a defense of Charles I purporting to have been written by the king himself; bishop of Exeter and of Worcester.
 Gaudier-Brzeska (*gô-dê-a' bzhês-kâ*), H. (1891-1915), French modernist sculptor; abstract or geometric forms in marble, alabaster, or commoner stones; unusual technical ability; killed in 1st World War.
 Gauge, or gage, a standard measure; a device for testing standard measurements; also a measuring or recording instrument: T-112
 block M-155
 micrometer M-155
 railroad track R-39
 rain R-48
 shotgun F-52
 wire W-121
 Gauguin (*gô-gân*), Paul (1848-1903), French painter, pioneer post-impressionist; disgusted with civilization, went to Tahiti and lived like the natives; paintings usually charged with symbolism; powerful influence on contemporary art: P-24
 Gaul (*gâl*), or Gallia, Latin name for districts occupied by Celtic peoples; (1) Cisalpine Gaul, now n. Italy; (2) Gaul proper or Trans-alpine Gaul, now modern France and Belgium with parts of Holland, Germany, and Switzerland
 Barbarian invasions E-323; Vandals V-271
 conquered by Romans C-124, C-12
 Druids in C-124
 "Gauleiter" (*gou'li-têr*), German word, meaning "district manager"; under Nazi rule, the name of an official appointed to manage a political district in Germany, or a foreign territory conquered or controlled by Germany.
 Gaulle (*gâl*), Charles André de (born 1890), French soldier, born Lille; fought in 1st World War; advocated mechanization of French army; became general in 2d World War; flew to England just before French surrender and became head of the Free French (later Fighting French); invaded Syria with British in 1941; became co-chairman with Giraud of French Committee of National Liberation June 1943 and chairman Nov. 1943: W-178j, 179g
 Gauls, Celtic people who early invaded western Europe
 capture Rome R-132
 in France F-171
 Gaunt, John of. See John of Gaunt
 Gauntlet, metal-plated gloves introduced as part of armor of knights about 13th century. A gauntlet thrown down was a challenge to fight. Term applied to any long, loose-cuffed glove.
 Gaur (*gaur*), or Gour, wild ox of India and s.e. Asia C-102
 Gaura (*gâ'rá*), a genus of annual and perennial plants of the evening primrose family, native to N. America. Large hairy leaves form rosette from which a tall stem grows; flowers white or rose in loose spikes at top of stem; fruit a 4-ribbed nutlike capsule.

Gauss (*gous*), Karl Friedrich (1777-1855), German mathematician and physicist, renowned as master of mathematical analysis; founded mathematical theory of electricity.
 Gautama (*gou'tâ-mâ*), or Gotama, family name of Buddha B-258
 Gautier (*gôt-yâ*), Théophile (1811-72), French poet, novelist, and critic; his personal eccentricities, have somewhat obscured his reputation as a literary craftsman of the first rank; wrote travel accounts, theater and art criticism of great excellence ('Emaux et camées', his best poems; 'Mlle. de Maupin', his greatest novel; 'Le Capitaine Fracasse', a novel; 'History of Dramatic Art in France'): F-197
 Gauze, transparent, loosely woven cotton fabric of many uses; heavier grades are classed as cheesecloth.
 Gavarni (*gâ-vâr-nê*) (1804-66), French caricaturist and illustrator; real name Guillaume Chevallier; prolific critic of Parisian life, especially of the poorer and somewhat disreputable classes.
 Gav'ston, Piers (died 1312), earl of Cornwall, arrogant, extravagant favorite of Edward II of England beheaded by barons E-189
 Gavial (*gâ-vi-âl*), Indian or Malayan reptile of order *Crocodylia*; long, narrow, flat snout with lumpy tip.
 Gaviiformes (*gâ-vi-i-fôr-mêz*), an order of fish-eating water birds, comprising the various genera of loons.
 Gavotte (*gâ-vôt'*), originally a French peasant dance, merry and light; after its introduction at court in 16th century became quieter and more dignified; very popular as a theatrical dance; special music for it written by Bach, Gluck, Grétry, and others.
 Gawaine (*gâ'wân*), in Arthurian legend, nephew of King Arthur and knight of the Round Table; called "the Courteous."
 Gay, John (1685-1732), English poet and dramatist ('Beggars' Opera'; 'Polly'; 'Fables'). See in Index 'Beggars' Opera'
 epitaph W-73
 literary friends S-343
 Gay, Walter (1856-1937), painter, born Hingham, Mass.; studied and lived in Paris; noted for still lifes; commander Legion of Honor; member of American Academy of Arts and Letters ('Benedicite'; 'Las Cigarreras').
 Gay, Zhenya, American artist, illustrator, and author of children's books; noted for distinctive lithographs; animals favorite models, especially cats ('Sakimura').
 Gayal (*gâ'âl*), species of native cattle (*Bos frontalis*) domesticated in n.e. India and regions adjacent for its flesh and skins; closely related to the gaur: C-102
 importation into U. S. forbidden Z-223
 Gayfeather, a perennial plant (*Liatris spicata*) of the composite family, grows wild from Massachusetts and Minnesota to Mexico. Has rough 6-ft. stem springing from cluster of grasslike leaves; flower spikes 4 to 15 in. long of rose-purple, rarely white, bundle-like heads; used in medicine; also called Kansas gayfeather, marsh blazing star, or liatris.
 Gay'ley, James (1855-1920), American metallurgist and manufacturer, born Lock Haven, Pa.; invented Gayley refrigerated dry-air blast in

blast furnaces; 1901-09 first vice-president U.S. Steel Corporation.
 Gay-Lussac (*gê-lû-sâk'*), Joseph Louis (1778-1850), French chemist and physicist, born St. Léonard, France; professor at Ecole Polytechnique, the Sorbonne, and Jardin des Plantes; made an academicien 1806; explained nature of prussic acid; discoverer of important law of gases; pioneer in scientific balloon observations; with Louis Thenard isolated boron.
 Gay-Lussac's Law, or Charles' Law, of gases G-18
 Gaza (*gâ'zâ*), Palestine, ancient town 50 mi. s.w. of Jerusalem; most important of the five Philistine cities. It was taken by Alexander the Great, and later became a rival of Alexandria and Athens as a center of Hellenic culture; pop. over 17,000: P-170, map B-8
 Gazania (*gâ-zâ-nî-â*), a South African genus of perennial or annual plants of the composite family. Some stemless, with leaves in cluster, others short stemmed, all with white-woolly hairs. Flowers daisy-like, solitary, on long stems, white, orange, or scarlet; in some, base of rays spotted, hence name peacock gazania (*G. pavonia*). Flowers close at night and leaves turn upward.
 Gazara. See in Index Gezer
 Gazelle (*gâ-zêl'*), an antelope A-218, color plate A-36b
 Gazelle hound, Persian, or Saluki D-83
 Gazi Antep, Turkey. See in Index Aintab
 Gdynia (*gâ-dîn-yâ*), Poland, port on Baltic sea a few mi. n.w. of Danzig; pop. 100,000; construction begun 1921 because Poles were unable to utilize Danzig for naval or military purposes; port opened 1923; large coal exports: P-277, map E-326d
 Ge. See in Index Gaea
 Gear, in mechanics, the moving parts or appliances by which motion is passed from one part of a machine to another
 automobile gears A-399-403, A-391, 394
 Geasa, an Irish spell M-30
 Geatland (perhaps same as Göta-land), homeland of 'Beowulf' B-97
 Gebal, Syria. See in Index Byblos
 Gebel (*gêb'êl*), or jebel, Arabic word for mountain.
 Geber (*gâ'bêr*) (Abu Musa Jabir ibn Hayyan) (flourished 776), Arabic scientist; held sound views on chemical research; suggested geologic formation of metals
 discovers nitric acid N-146
 founds alchemy C-178
 Geck'o, lizard L-171, picture L-172
 foot, picture F-147
 Ged, William (1690-1749), Scottish goldsmith and printer, inventor of a stereotyping process.
 Geddes (*gêd'ês*), Sir Auckland Campbell (born 1879), British ambassador to U. S. 1920-24; formerly professor of anatomy at McGill University.
 Geddes, Sir Eric (1875-1937), British politician, director-general of military railways and inspector general of transportation during World War (1916-17); first lord of the admiralty (1917-18); chairman Imperial Airways, Ltd., at time of death; brother of Sir Auckland Geddes.
 Geddes, Jenny, starts Scottish rebellion S-46
 Geddes, Norman Bel (born 1893), American artist, born Adrian,

Mich.; turned from portrait painting to advertising and illustrating, then to stage design, in which he achieved some remarkable and unusual effects, and to industrial designs, including ships, planes, traffic plans, and the "city of tomorrow" for the New York World's Fair model of ocean liner, *picture* A-81

Geelong (*gê-lông'*), Australia, seaport in Victoria 40 mi. s.w. of Melbourne; pop. 40,000; important woolen trade and manufactures; quarrying: *map* A-372a

Geese. See in *Index* Goose

Geese, sacred, how they saved Rome R-132

Gegenbaur (*gê'gn-bour*), Karl (1826-1903), German comparative anatomist; first to study anatomy from evolutionary standpoint ('Comparative Anatomy of Vertebrates').

Gehen'na, or Valley of Hinnom, in Palestine near Jerusalem J-211

Geijer (*yâ'yêr*), Erik Gustaf (1783-1847), Swedish poet, composer, and historian; professor of history University of Uppsala; wrote stirring music to his own verses.

Gelkie (*gê'ki*), Sir Archibald (1835-1924), Scottish geologist ('Story of a Boulder'; 'Class Book of Geology') calculates earth's age E-130

Gelsha (*gê'shâ*), in Japan J-189

Geissler (*gis'lêr*), Henry (1814-79), German maker of scientific instruments, for whom Geissler tubes were named.

Geissler tube, a sealed glass vessel containing rarefied gas and electrodes between which high-voltage electricity is passed, causing the gas to glow brilliantly; used principally in spectroscopy: X-198 glowing explained E-243

Gel, in colloid chemistry C-303

Gelada baboon cost to zoos Z-221

Gelatin, or gelatine, a proteid-like jelly of unknown chemical composition, obtained by boiling various animal tissues G-25

colloidal nature C-302, 303

effect of potassium bichromate C-231

glue a form of G-107-8

photo engraving processes E-298

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protein in bones B-109

seaweed yields S-73

shatterproof glass G-104

Gelatin dynamite, derived from cellulose nitrate, *chart* C-123

Gelding, an unsexed male horse H-345

Gelée (*zhû-lâ'*), Claude (1600-82), known as Claude Lorrain, French landscape painter P-21

Gelibolu. See in *Index* Gallipoli

Gelon (*gê'lôn*) (died 478 B.C.), Greek leader, succeeded Hippocrates as tyrant of Gela, Sicily (491 B.C.); Syracuse, of which he became tyrant about 485 B.C., attained great power and riches under his rule; defeated Carthaginians 480 B.C.

Gelsemium (*gêl-sê'mi-ûm*), or Carolina yellow Jessamine, a smooth twining shrub (*Gelsemium sempervirens*) of the logania family with opposite shining lance-shaped leaves and small fragrant funnel-shaped flowers in axillary clusters; rootstock yields drug *gelsemium* used in treating neuralgia, convulsions, bronchitis, and similar ailments; South Carolina state flower.

Gelsenkirchen (*gêl'zn-kîrk-ûn*), industrial town in Westphalia, Germany, 8 mi. n.w. of Essen; pop. 325,000; coal mines, iron and steel works, soap, glass, chemicals.

Gemara (*gê-mû'râ*), part of the Talmud H-267

Gemini (*gêm'i-ni*), or Heavenly Twins, a constellation in the zodiac Z-218, *charts* S-275, 275c, f, h named for Castor and Pollux C-95

Gemmae, or brood buds. See in *Index* Budding

Gemmation. See in *Index* Budding

Gems G-25-9, M-184

aluminum in A-139

birthday stones G-25

British crown jewels L-184: Queen Mary wearing, *picture* G-53

cameos C-39

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chromium in C-230

corundum varieties E-260

cutting: diamonds D-60, 62, *picture* D-60, *color plate* G-27a-b; machine method G-26

design G-25-6, *pictures* G-26, 27, D-60, *color plate* G-27a-b

imitation, making G-26

silicon content S-143

superstitions G-26, 28, 29

synthetic, distinguished from natural and imitation G-26

Gemsbok (*gêmz'bôk*), large antelope of south and west Africa (*Oryx gazella*); about 4 feet high; straight horns sometimes 3 feet long; valued for its flesh and hide.

Gem State, or Gem of the Mountains, popular name for Idaho I-7

Gendarmes (*zhân-dârm'*), French national police, employed in all departments and colonies of Louis XIV and Napoleon P-287

Gender

nouns N-179

pronouns P-352

Genée (*zhê-nâ'*), Adeline (born 1882), Danish dancer, one of greatest exponents of classical ballet; American appearances 1908-13; tremendous success with her own program 'La Danse'; few appearances after 1916; came to U. S. 1940.

Genera (*gên'ê-râ*), plural of *genus*. See in *Index* Genus

General, in U. S. Army, grade appropriate to command of a field army; term often loosely applied to any commander higher than colonel: *table* A-307d

men holding full rank P-128, M-1

U. S. insignia, *picture* U-178

General Accounting Office, U. S. U-231

General assembly, in state government S-278

General court, in state government S-278

General Education Board, an organization founded by John D. Rockefeller, Sr., 1902, to distribute his gifts for "the promotion of education within the U. S. without distinction of race, sex, or creed"; chartered by Congress 1903 report on Gary schools G-18

scholarships and fellowships U-259

General Federation of Women's Clubs W-131

General Grant National Park, now in Kings Canyon National Park N-22b

General Land Office, U. S., bureau of Dept. of Interior; commissioner appointed by president; established 1812; administers public lands: U-230, L-60

General officer, in the U. S. Army A-307d

"General Sherman," giant tree in Sequoia National Park S-80, N-22d, *picture* C-27

General Staff, an organized body of officers which assists the commander in chief or chief executive in controlling the land or naval

forces of a nation; sometimes created for a major detachment, such as the American Expeditionary Forces of the first World War U. S. army U-224: insignia, *picture* U-178

General strike L-44c

Generations, alternation of. See in *Index* Alternation of generations

Generator, belt. See Belt generator

Generator, electric E-215-18. See also in *Index* Electric generator

Genes (*gênz*), parts of chromosomes that transmit heredity H-284

Genesee' River, N. Y., rises in Pennsylvania; empties into Lake Ontario 7 mi. n. of Rochester; 135 mi. long: R-120-1, *map* N-114

Genesis (Greek "coming into being"), the first book of the Bible, sometimes called Book of Creation; it tells of the creation of the world, of the foundation of the Israelite nation, and of the nation's history down to deaths of Jacob and Joseph in Egypt

Michelangelo's frescoes M-146, *picture* M-147

Genêt (*zhû-nê'*), Edmond C. E. (1765-1834), "Citizen Genêt," French diplomat, minister to U. S. (1793-94) at time of French Revolution, sent to induce U. S. to declare war on Great Britain; U. S. requested his recall for unneutral acts; married daughter of Gov. George Clinton and became American citizen outfits privateers W-20

Genetic psychology P-361

Genetics, the scientific study of heredity: See in *Index* Heredity

Geneva, N. Y., city on Seneca Lake 38 mi. s.e. of Rochester; pop. 15,555; preserved goods, cutlery, optical supplies, stoves, boilers; nurseries; Hobart College: *map* N-114

Geneva (*gên'ê-vâ*), French Genève (*zhû-nêv'*), Switzerland, city on Lake Geneva; pop. 125,000: G-29-30 center of Calvinism C-35

League of Nations L-78: palace, *picture* L-77

Red Cross organized R-59-60

Geneva, Lake, also Lac Leman, largest lake in Switzerland, in s.w. bordering on France; 224 sq. mi.; 45 mi. long: G-30, *map* S-351, *picture* G-29 geological formation L-55 Rhone flows through R-100

Geneva arbitration, conference which settled the Alabama claims A-99

Geneva College, at Beaver Falls Pa.; founded 1848 by Reformed Presbyterian church; arts and sciences.

Geneva Convention ("Red Cross Treaty") R-59-60

Geneva Naval Conference (1927) C-354

Geneviève (*zhên-vê-yêv'*), Saint (422?-512 A.D.), a patron saint of Paris, said to have saved Paris from Attila's Huns by her prayers; caused church to be built over tomb of St. Denis; festival Jan. 3.

Genghis (Jenghiz, or Jinghis) Khan (*gên'gis kân*) (1162-1227), conqueror who first raised Mongol race to power and swept over Asia M-223

Afghanistan invaded A-31 descendants seize India I-38 followers called Tatars T-16

Genii (*gê'ni-i*), or jinn, supernatural beings with magic powers; appear frequently in oriental literature.

Genius, according to the belief of the ancients a guardian spirit, good or bad, who presided over the birth of a child and had charge of its destiny. The term has come to be ap-

- plied to an extraordinary gift or aptitude, especially as displayed in creative work
Edison's definition E-159
emotion plays part E-262
- Genlis** (*zhän-lēs'*), Stephanie, Comtesse de (1746-1830), French author and educator, tutor to Philippe Egalité's children, including Louis Philippe; anticipated many modern methods of teaching.
- Gennargentu** (*gên-när-gên'tp*), Mount, highest range in Sardinia; near center of island; highest point 6000 ft.
- Gennes'aret**, Lake, or Sea of. *See in Index* Galilee, Sea of
- Genoa** (*gên'ô-à*) (Italian, Genova), Italy, seaport on Mediterranean, gateway to n. Italy; pop. 625,000: G-30, I-164, map I-156, picture I-167
defeated at Chioggia by Venice V-279, G-30
medieval trade center C-322, G-30
textile industry T-64
war with Pisa G-30, P-223
- Genoa**, Gulf of, large indentation of Mediterranean in n.w. Italy, with city of Genoa at its head; broad southern portion known as Ligurian Sea, map I-156
- Genova** (*gân'ô-vâ*), Italy. *See in Index* Genoa
- Genre** (*zhän'rü*) painting P-18
- Genro** (*gên'rô*'), in Japanese government, the unofficial body made up of elder statesmen who formerly advised the emperor J-191a
- Gens** (*gênz*), a social group F-11
- Genseric** (*gên'sër-ik*), or Gaiseric (390?-477 A.D.), Vandal king; conquered n. Africa including Carthage (429-39); plundered Rome (455): V-271-2
- Gentian** (*gên'shân*), an autumn flower G-30-1
- Gentian family**, or **Gentianaceae** (*gên-shi-â-nâ'sê-ê*), a family of plants and shrubs including the gentians, exacum, buckbean, centaury, and water snowflake.
- Gentile** (*gên-tê'lâ*), Giovanni (born 1875), Italian philosopher; founder and director school of philosophy, Rome; minister of education under Mussolini; made drastic reforms in school system.
- Gentiles**, term used in Bible for non-Jews.
- Gentileschi** (*gên-tê-lês'kê*), Orazio (1565?-1647), Italian painter, born Pisa; decorated interiors of several palaces in Rome; in 1626 settled in England where Van Dyck painted his portrait; paintings are vivid in color but lack composition; his best works: 'Moses Saved from the Waters', 'Annunciation', 'Joseph and Potiphar's Wife'. His daughter, Artemisia Gentileschi (1590-1642), born Rome, became popular in England as a portrait painter and equaled her father in historical painting ('Judith and Holofernes'; 'Christ among the Doctors').
- "Gentlemen Adventurers," members of the Hudson's Bay Company F-225
- Gentlemen's agreement**, an agreement binding only as a matter of honor and not legally enforceable, as between business rivals to adhere to certain prices and methods of sale; applied also to certain agreements between nations.
- Genus** (*gênûs*), a group of related species of plants or animals B-116, A-200, 202, B-132
- Geodesy**, measurement of the earth or large portions of the earth's surface S-331
- Geodetic** surveying, surveying in which the curvature of the earth is taken into account S-331, 332
U. S. Coast and Geodetic Survey U-227
- Ge'oduck**, a large, edible clam C-259
- Geoffrey** (*gêf'ri*), of Monmouth (1110?-1154), Welsh historian, bishop of St. Asaph ('History of the Britons')
Arthurian legends A-316
- Geoffrey Plantagenet** (1113-51), count of Anjou, husband of Matilda (daughter of Henry I of England), and father of Henry II S-284
meaning of "Plantagenet" H-275
- Geoffroy-Saint-Hilaire** (*zhô-frwâ-sân-tê-lêr'*), Etienne (1772-1844), French naturalist, pre-Darwinian believer in mutability of species, founder of the science of teratology or study of monsters.
- Geographical distribution of animals and plants.** *See in Index* Ecology
- Geographical Society**, American G-34
- Geography** G-31-4, *Outline* G-35-8.
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oceans and water formations O-195-201, *Outline* G-36, 37
picture-books, value L-108
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rainfall R-46-8, D-113a-b
rivers R-109-11, *Outline* G-37
rock and soil S-190-191d, *Outline* G-36
societies and associations G-34
- Geological Survey**, U. S., a bureau of the Department of the Interior established in 1871 U-230-1, G-45
- Geology**, the science of the earth, its origin, evolution, materials, and physical structure G-39-46, P-197-202. *See also in Index* Animals, prehistoric; Earth; Fossils; and chief topics listed below
age of earth E-130, G-42
Antarctic ice cap studies A-217
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- economic G-39-40, 45-6
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valleys V-269, P-201, pictures P-199
volcanoes V-331-4, picture P-199: lava L-73
vulcanism P-197-8, 202
- Geom'etry**, the science that treats of mathematical relations and measurements in space G-46-52
analytical G-52
non-Euclidean G-52
projective G-52
Pythagorean contributions P-374, G-46
surveying applications S-331-2
- Geophysical prospecting**, for minerals M-186
- Geophysical sounding**, in polar ice cap measurement P-286
- Geophyte** (*gê'ô-fit*), a plant with an underground root or tuber B-269
- Geopolitics** (*jê'ô-pôl-i-tiks*), a science which treats of the dependence of the politics of a people upon geographical environment.
- George**, Saint (died 303), patron saint of England; festival April 23: G-54
festival day H-322
how he slew the dragon D-87-8
- George I** (1660-1727), king of England G-52
Handel and, picture H-209
makes South Carolina royal province S-216
- George II** (1683-1760), king of England G-52
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royal library given to British Museum B-188
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- George III** (1738-1820), king of England G-52-3
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William Pitt P-224
- George IV** (1762-1830), king of England G-53
- George V** (1865-1936), king of England G-53-4, pictures G-53, E-190
addresses London Conference (1930), picture H-337

ü=French u, German ü; gê, gô; thî, then; ñ=French nasal (Jean); zh=French j (z in azure); ɣ=German guttural ch

George VI (born 1895), king of England G-54, *picture* G-54
Stanley Baldwin and B-17

George I (1845-1913), king of Greece, son of Christian IX of Denmark; ascended throne 1863; gained territory for Greece in war with Turkey 1911-13; assassinated (1913) by one of his subjects.

George II (born 1890), king of Greece, proclaimed 1922 following abdication of father, Constantine G-163
Venizelos and V-280

George (1653-1708), prince of Denmark and husband of Queen Anne of England.

George, David Lloyd. *See in Index* Lloyd George

George, Grace (born 1880), American actress, born New York City; married William A. Brady, producer; début, 1894, in 'The New Boy'; starred in 'Divorçons'; 'The Truth'; 'The Road to Rome'; 'The First Mrs. Fraser.'

George, Harold Lee (born 1893), army officer and aviation expert, born Somerville, Mass.; appointed chief U.S. Ferrying Command April 1942 head, Air Transport Command N-12h

George, Henry (1839-97), American author and political economist, born Philadelphia, Pa.; named "single tax" and made it a social creed 'Progress and Poverty' T-18

George, James Zachariah (1826-97), American statesman, born Monroe Co., Ga.; chief justice Miss. supreme court 1879-81; U.S. senator after 1881.

George (ġā'ōrk), Stefan (1868-1933), German poet; opposed naturalism; verse classical and scholarly, with emphasis on form ('The Year of the Soul'; 'Songs of Dreams and Death'; 'The Star of the Covenant').

George, W. L. (1882-1926), English novelist and essayist; especially concerned with study of women and their problems ('A Bed of Roses', 'The Second Blooming', 'Blind Alley'; 'Woman and Tomorrow').

George, William R. (1866-1936), American sociologist, born West Dryden, N. Y.; founded George Junior Republic

George Junior Republic G-54

George, Fort, trading post on upper Fraser River, B.C.; established 1807 by Simon Fraser; now called Prince George.

George, Lake, long narrow lake in e. New York inclosed by mountains; 32 mi. long; famed for beauty; battles in French and Indian War: *picture* N-115, *map* N-114

George Junior Republic G-54

George Peabody College for Teachers, a nonsectarian institution at Nashville, Tenn., organized 1910 to succeed Peabody Normal College; founded by the George Peabody Fund: P-90-1, *picture* T-48

George Pepperdine College, at Los Angeles, Calif., founded 1937; arts and sciences.

Georgetown, cap. of British Guiana, on n. coast of South America at mouth of Demerara River; pop. 66,000; tropical exports: G-183, *map* G-183
U.S. naval base, *map* N-51

Georgetown, former town, now part of Washington, D. C. W-26

Georgetown, Ky., agricultural and stock-raising center 18 mi. e. of Frankfort; incorporated 1790; pop. 4420; Georgetown College: *map* K-11

George Town, or Penang, cap. of Settlement of Penang, Straits Settlements; on Penang Island 2½ mi.

from w. coast of Malay Peninsula; pop. 150,000; 2d largest port in the Straits: *map* A-332c

Georgetown College, at Georgetown, Ky.; Baptist; founded 1829; arts and sciences.

Georgetown University, Roman Catholic (Jesuit) institution for men, in Washington, D. C.; founded 1789; oldest Jesuit college in U. S.; arts, philosophy, medicine, dentistry, dental hygiene, law, foreign service.

Georgette crêpe, a thin, dull silk fabric with crêpelike surface.

George Washington Birthplace, national monument in Virginia N-22, *picture* W-13

George Washington Memorial Bridge, N.Y. B-240b, *pictures* N-127, N-91, W-120, *table* B-342

George Washington University, at Washington, D. C.; chartered 1821 as Columbian College; since 1904 under present name; non-sectarian; junior college, Columbian College (senior college); graduate school; schools of medicine, nursing, law, engineering, pharmacy, education, government; divisions of library science, fine arts.

Georgia (Georgian Soviet Socialist Republic), also Sakartvelo, a republic of Soviet Russia, bordering Black Sea; 27,000 sq. mi.; pop. 3,545,000; cap. Tiflis: G-59, *map* B-154

Georgia, a s. Atlantic state of U. S.; cap. Atlanta; 58,876 sq. mi.; pop. 3,123,723: G-55-9, *maps* G-56, U-188c

agriculture G-55: cotton G-55; tobacco T-103

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national monuments and memorials

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natural features G-55

pine G-56, P-220

products: *chart* G-56, list G-55

prohibition, colonial days P-350

Georgia, Strait of, arm of North Pacific Ocean separating s. half of Vancouver Island from mainland of Canada; between Vancouver on w. and British Columbia on e.

Georgia, University of, state institution at Athens, Ga.; opened 1801 (chartered 1785); classics, agriculture, law, pharmacy, forestry, education, commerce: *picture* G-57

Georgian Bay, an arm of Lake Huron H-363, *map* G-147
Trent Canal C-69, H-363

Georgian Bay Islands National Park, a Canadian park comprising 30 islands in the Georgian Bay archipelago, Ontario; recreational area noted for fine fishing: N-23

Georgian Court College, at Lakewood, N.J.; Roman Catholic; for women; founded 1908; arts and sciences.

Georgian furniture, 18th-century English furniture I-104-5

Georgian style, of architecture A-168
Georgia pine, Southern yellow, or long-leaf pine P-220, 221, G-56
annual cut in U. S. U-194

Georgia School of Technology, at Atlanta, Ga., state institution for men, established 1888; engineering, chemistry, and architecture.

Georgia State College for Women, Milledgeville, Ga., established 1889; college of arts and sciences, and teachers college.

Georgia State Woman's College, at Valdosta, Ga.; state institution, founded 1906; arts and sciences.

Georgia Warm Springs Foundation, at Warm Springs, Ga., about 40 mi. n.e. of Columbus; established 1926 by President Franklin D. Roosevelt for the treatment and care of persons who have had infantile paralysis: R-146d

'Georgics', poem by Vergil V-284

Geotropism, tendency of plant structures, especially roots, to seek the earth P-241

bean rootlet, *pictures* B-66

Geraint (ġē-rānt'), Sir, knight in Arthurian legends, hero of Tennyson's 'Geraint and Enid'.

Geraldine (ġēr-āl-dīn) the Fair, Lady Elizabeth Fitzgerald, celebrated in some of the Earl of Surrey's sonnets; in late romantic legend, object of Surrey's fantastic devotion.

Géraldy (zhā-rāl-dē'), Paul (born 1885?), French poet and playwright; simple, straightforward style ('To Love', 'The Nest', plays).

Gera'nium, flowering plant G-60

Geranium family, or Geraniaceae (ġē-rā-ni-ā'sē-ē), a family of plants and shrubs, including the geraniums, cranesbill, herb-robert, heronsbill, alfilaria, and storksbill.

Gérard (zhā-rār'), François Pascal, Baron (1770-1837), French painter; pupil of David; classical subjects. 'The Three Ages', 'Daphnis and Chloe'; historical, 'Battle of Austerlitz'; more than 300 portraits, with good characterization and elegant backgrounds—'Madame Récamier'.

Gerard', James W. (born 1867), American lawyer and diplomat, born Geneseo, N. Y.; ambassador to Germany 1913-17 ('My Four Years in Germany').

Gerbera (ġēr-bē-rā), or Gerberia, a genus of perennial plants of the composite family, native to S. Africa and Asia. The Transvaal daisy (*Gerberia jamesoni*) has bright orange flowers high above the woolly leaves; some have white, pink, or red flowers.

Gerbert. *See in Index* Sylvester II

Gerfacon H-246

Gerhardt (ġēr'härt), Paulus, or Paul (1607-76), German hymn writer; considered greatest of his time; strong supporter of Lutheranism ('O Sacred Head Once Wounded': 'Commit Thou All Thy Griefs').

Géricault (zhā-rē-kō'), J. L. A. Théodore (1791-1824), French painter. leader of Realistic School and of revolt against David's classicism.

Gericke (ġēr'ik), William F. (born 1884), American plant expert, born Fremont, Neb. P-245g-h

Gérin-Lajoie (zhā-rān'lā-zhūwā'), Antoine (1824-82), French-Canadian novelist and poet, born Yamachiche, Quebec; editor *La Minerve* (Montreal); one of founders and for several years president L'Institut Canadien ('Un Canadien', poem; 'Jean Rivard', novel; 'Dix ans d'Histoire du Canada').

Gerizim (*gêr'i-zim* or *gê-rî'zim*), Mount, Palestine P-33

Germ, the embryo, usually small, in a seed or egg E-192. *See also in Index* Embryo; Embryology

Germ, popular name for a disease-producing bacterium or protozoan G-77-80. *See also in Index* Germ theory of disease

German, Sir Edward (1862-1936), English composer; incidental music for several Shakespearean plays; comic operas ('Nell Gwyn'; 'Merrie England'); symphonies; suites; rhapsodies; songs.

German Baptist Brethren. *See in Index* Dunkers

German boxer, dog D-82, *picture* D-84

German cockroach, or Croton bug C-291

German Confederation (1815) G-72

German East Africa, former name of Tanganyika Territory, now under British control. *See in Index* Tanganyika Territory

Germanic languages, or Teutonic languages G-60, 62, P-171

Germanic peoples. *See in Index* German tribes

Germanicus, Caesar (15 B.C.-19 A.D.), Roman general, nephew of Tiberius; had nearly conquered Germany when jealousy of Tiberius led to his recall and transfer to Syria; believed to have been poisoned at instigation of emperor.

Germanium, a rare metallic element, resembles tin and lead, has no commercial value, *table* C-168

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German literature G-60-4, *Outline* L-63. *See also in Index* names of chief writers

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German mile, *table* W-67

German New Guinea, now Mandated Territory of New Guinea N-85

German philosophers P-173

German Reformed Church. *See in Index* Reformed churches

German shepherd, or police dog D-83

German silver, an alloy N-142-3, C-361

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Germans in America

colonial immigration A-160, 161, V-306, 308; North Carolina N-159; Pennsylvania P-116; Wisconsin influx W-126

German Southwest Africa, former German colony, now a British mandate. *See in Index* Southwest Africa

Germantown, Pa., former n.w. suburb, now district, of Philadelphia; scene of battle in Revolutionary War (October 4, 1777) in which Washington's surprise attack against Howe failed: W-59

German tribes, or Teutonic tribes E-322-3. *See also in Index* separate tribes by name
conquer England E-270
converted to Christianity B-174, G-62

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described by Tacitus G-71, G-60

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invade Roman Empire M-158-9, G-71, F-171

languages and literature G-60, 62
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Lombards L-181

Northmen N-166-70

physical characteristics R-10

Scandinavia S-36

Vandals V-271-2

German-Volga Republic, an autonomous republic of the Russian Soviet Federative Socialist Republic, on lower Volga; about 10,800 sq. mi.; pop. 605,000; farming of drought-resistant crops chief occupation; cap. Engels (pop. 73,000).

German Workers' Party H-311

Germany, a national socialist republic in cent. Europe; area of Germany proper 226,100 sq. mi., of Greater Reich, 260,000 sq. mi.; pop. of Germany proper 79,730,000, of Greater Reich 89,200,000; cap. Berlin: G-65-77, *maps* G-66, E-326c, d-e, f, *Outline* G-76b-77
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wood-carving W-138

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H-204; political parties G-74-6,

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D-47; social legislation S-179; un-

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G-74; under Nazis G-75-76b

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cis I F-186

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 Memel acquired L-164
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 Danzig annexed D-14, W-178c-d
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 invasion of France F-182, 184, W-178i: surrender and armistice W-178i-j; Lorraine annexed A-137

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 discovery G-78
 Koch's work G-78
 Lister's work A-222, I-116
 Pasteur's work P-86, B-116
 viruses G-77, 78, 80

Gérome (*zhā-rōm'*), Jean Léon (1824-1904), French painter and sculptor, noted especially for his spirited portrayal of historical and classical scenes ('Gladiators before Caesar'; 'Slave Market in Rome')

Caesar and Cleopatra, picture C-264
 Greek actors, picture D-92

Geronimo (*gē-rōn'i-mō*) (died 1909), Apache (Chiricahua) chief; harried and terrorized Arizona and New Mexico 1884-86; surrendered to General Crook, escaped, was recaptured by General Miles
 imprisoned in Oklahoma O-220

Gerould, Katharine Fullerton (born 1879), American essayist and story writer, born Brockton, Mass. ('Vain Oblations'; 'Modes and Morals'; 'Aristocratic West')

Gerry, Elbridge (1744-1814), American statesman, born Marblehead, Mass.; one of the signers of the Declaration of Independence; member of Constitutional Convention; governor of Massachusetts 1810-12
 Gerrymander named for G-80
 vice-president M-20
 'X Y Z' affair X-202

Gerry, Elbridge T. (1837-1927), American philanthropist, born New York City; grandson of Elbridge Gerry; founder of the Society for Prevention of Cruelty to Children, often called the "Gerry Society."

Ger'ymander G-80-1

Gershwin, George (1898-1937), American composer, born Brooklyn, N. Y.; exponent of "classical jazz"; orchestral works: 'Rhapsody in Blue', 'Concerto in F', 'An American in Paris'; musical comedies: 'Lady Be Good', 'Of Thee I Sing'; opera: 'Porgy and Bess'.

Gertrude, Saint (the Great) (1256-1302), German Cistercian nun and mystic writer born Thuringia; patroness of West Indies; festival November 15.

Geryon (*gē'ri-ōn*), a monster in Greek mythology H-282

Gesneria (*gēs-nē'ri-ā*) family, or Gesneriaceae (*gēs-nēr-i-ā'sē-ē*), a family of plants and shrubs, na-

tive to the tropics and subtropics, including African violet, gloxinias, cape-primrose, and episcias.

Gessler (*gēs'lēr*), a legendary Austrian official defied by William Tell T-43-4

Gesso (*gēs'sō*), in art, a raised ground of plaster for painting or for relief form of sculpture; used in mural painting, also in decorating boxes, screens, panels, etc.

Gest (*gēst*), Morris (1881-1942), Russian-American theatrical producer, born Vilna; with F. Ray Comstock, 1905, produced 'The Miracle'; brought Chauve-Souris and Moscow Art Theatre to America; director motion pictures since 1926.

Gestalt (*gē-shtält'*) theory P-362
 Gestapo (*gē-shtā'pō*) contraction for *Geheime Staatspolizei*, German secret police organized by Adolf Hitler 1933 and headed by Heinrich Himmler since 1934.

Gesta Romanorum (*gēs'tā rō-mā-nō-rūm*), collection of tales from Roman sources, compiled in Middle Ages; source of plots for Gower, Chaucer, Shakespeare.

Geta (*gē'tā*), clog shoes of Japan J-188a

Gethsemane (*gēth-sēm'a-nē*), garden e. of Jerusalem; scene of Christ's agony on night before crucifixion: J-212, 214, picture J-212

Getters, in light bulbs V-268

Gettysburg (*gēt'iz-būrg*), Pa., borough 35 mi. s.w. of Harrisburg; pop. 5916; scene of decisive battle in Civil War; map P-112

Gettysburg, battle of (July 1-3, 1863) G-81-2, H-207

Meade at M-95

'Gettysburg Address', by Abraham Lincoln G-82: text L-142

Gettysburg College, at Gettysburg, Pa.; Lutheran institution founded 1832; liberal arts.

Gettysburg National Military Park, Pa. G-82

Geum (*gē'ūm*), a genus of perennial plants of the rose family; leaves from root are lobed, those on stems, bractlike; flowers red or yellow, single or double, like the poppy; also called avens.

Geyser (*gē'zēr*) G-82-4

Iceland I-5, picture I-5a

New Zealand N-135

Yellowstone Park Y-205, pictures G-83, N-17

Gezelle, Guido (1830-99), Flemish poet, born Bruges, Belgium; educated as a priest; lived at Courtrai for 28 years as a curate; his poems, written in the dialect of West Flanders, are deeply religious.

Gezer (*gē'zēr*), or Gazara, ancient royal city of Canaan 20 mi. n.w. of Jerusalem; important frontier post in Maccabean wars

calendar and potsherd, picture A-135, table A-134b

Gezireh, or Gezira (*gā-zē'rā*), wedge-shaped plain between White Nile and Blue Nile in Anglo-Egyptian Sudan; irrigated from 50-mi. lake, created by 2-mi. dam (opened 1926) across Blue Nile, which can flood 2800 miles of canals; after 1939 mostly in province of Gezira (54,605 sq. mi.; pop. 968,000).

Ghadames (*gā-dā'mēs*), or Gadames, town of Libya in an oasis of the Sahara Desert, about 300 mi. s.w. of city of Tripoli; pop. about 8000: map A-42a

Gharapuri. See in Index Elephanta Isle

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŭde, fŭll, bŭrn;

- Ghardaia, town and oasis in Algeria, map A-127
- Ghat (*ġāt*), or Gat, town and oasis of Sahara Desert in s.w. Libya; pop. about 8000: S-4, map A-42a
- Ghats (*ġāts*), two mountain ranges parallel with e. and w. coasts of peninsula of India, known as Eastern and Western Ghats I-31-2, 33
- Ghats
burning ghats, picture B-95
steps B-95
- Ghazl (*ġā'zē*), Moslem title
Mustapha Kemal T-161
- Ghazni (*ġā'z'nē*), strategic town in e. Afghanistan on route between India and Persia; taken by English 1839 and 1842; seat of medieval Empire of Ghazni, which rose to its height of power and wealth under reign of Mahmud of Ghazni: map A-31
- Ghebers (*ġē'bēr'z* or *ġā'bēr'z*), Gabers, Guebers, Ghavers, name given in Persia to followers of Zoroaster; known in India as Parsees. See in Index Zoroaster
- Ghee (*ġē*), clarified butter B-282, picture B-261
- Ghent (*ġēnt*), Belgium, also Gand, picturesque city, famous for flowers, many bridges, and relics of Middle Ages; pop. 165,000 (with suburbs, 220,000): G-84, map B-87
altar-piece, 'The Adoration of the Lamb', picture M-315
book trade, medieval B-180
medieval trade center B-87
"Ghent, great bombard of," a cannon A-322
- Ghent, Treaty of, ending War of 1812 between U. S. and Great Britain (1814) W-11
Clay helps draft C-261
- Ghent azalea, a hybrid A-408
- Gherkin (*ġēr'kīn*), type of cucumber used for pickling C-413
- Ghetto (*ġēt'ō*), Jewish quarter of a city; in medieval times an urban section where Jews traditionally were required to live; segregation of Jews in ghetto made enforceable by law under Pope Paul IV in Rome 1555; also enforced in Frankfurt, Prague, Avignon, Venice, and other European cities; gradually abolished in 19th century, but reestablished in many places after outbreak of 2d World War
Warsaw W-11
- Ghibellines. See in Index Gueifs and Ghibellines
- Ghiberti (*ġē'bēr'tē*), Lorenzo (1378-1455), Italian sculptor G-84
Baptistry doors G-84, I-168, picture G-85
place in Renaissance art S-57
- Ghilzal (*ġīl'zī*), Afghan race A-29
- Ghlorides, or Turkish knot, in weaving R-172
- Ghirlandaio (*ġēr-lān-dū'yō*), Domenico (1449-94), Italian fresco painter; greatest of a family of Florentine painters; tendency toward realism and individual expression; scenes from life of St. Francis and 'Adoration of the Shepherds' (1485) in Sassetti Chapel, St. Trinita Church, Florence
Michelangelo apprenticed to M-146
- Ghormley, Robert Lee (born 1883), naval officer, born Portland, Ore.; with Navy after 1906; commander of United Nations' naval forces in s. Pacific March-Oct. 1942; in immediate charge Solomon Islands campaign Aug.-Oct. 1942; later made commander of the Hawaiian sea frontier and commandant of the 14th naval district.
- Ghost-fish. See in Index Wrymouth
- Ghost flower, or Indianpipe, a plant, picture F-218
- 'Ghosts', play by Ibsen (1881); shows in the life of Oswald Alving the relentlessness of inherited evil, and in the life of Mrs. Alving that virtues may become vices when not directed with intelligence and truth.
- Giacosa (*ġā-kō'sā*), Giuseppe (1847-1906), Italian dramatist
chief works I-154
- Giambologna (*ġām-bō-lōn'yā*). See in Index Bologna, Giovanni da
- Giant albacore, tunny, or tuna fish T-154-5
- Giant arborvitae (*ār-bōr-vī'tē*). See in Index Western red cedar
- Giant cactus, common name of several large cacti, especially the saguaro C-10, A-291
- Giant chinquapin, or golden-leaved chinquapin C-222
- Giant clam C-259, S-107-8, picture C-258
- Giant fir, grand fir, or lowland white fir, evergreen tree (*Abies grandis*) of pine family, native from Vancouver Island to California and Montana. Grows 80 ft. to 200 ft. Leaves to 2½ in. long, notched at tip, with 2 white bands on underside. Cones oblong, bright green, to 4 in. long. Sometimes called silver fir, yellow fir, western white fir, and grand white fir. Marketed as "white fir."
- Giant Mountains, also Riesen Gebirge, highest range of Sudeten Mts., between Silesia and Bohemia, Germany; highest point the Schneekoppe (5265 ft.).
- Giants
Antaeus H-282
circus C-237e-f, picture C-237c
Cyclops C-419
Giant Despair in 'Pilgrim's Progress' B-275
'Gulliver's Travels' S-343
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Prometheus P-351
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- Giant's Causeway, natural formation of close-fitting prismatic columns of basalt rock on n. coast of Ireland, map E-270a, picture I-125
- Giant spider crab C-388, picture C-389
- Giant squid S-265, C-416
cachelot whale attacks W-80
swordfish attacks S-359
- Giant tortoise, picture T-167
- Giant water-bug, or electric-light bug W-47, I-85, picture W-46
- Gibault (*zhē-bō'*), Pierre (1737-1804), Roman Catholic missionary, born Montreal; labored at Kaskaskia, Vincennes, and Cahokia; aided George Rogers Clark by securing friendship of colonists and Indians around Vincennes (1778).
- Gibbon, Edward (1737-94), English historian; his 'Decline and Fall of the Roman Empire' is a monumental work of prodigious learning and brilliant style
association with Johnson E-286
quoted on Arthurian legends A-316
- Gibbon, a small East Indian ape with long arms A-226, picture M-266
hand, picture A-225
- Gibbons, Grinling (1648-1720), English wood carver; did work for Christopher Wren and for royalty; finest production, ceiling at Petworth (in Sussex), made for Duke of Devonshire; excelled in elaborate, delicate carving; influenced work of Chippendale: picture W-137
- Gibbons, Herbert Adams (1880-1934), American writer on history and political economy; born Annapolis, Md. ('The New Map of Asia'; 'Eu-
- rope Since 1918'; 'Europe of Today').
- Gibbons, James, Cardinal (1834-1921), American Roman Catholic churchman and public leader G-84-6
buried in Baltimore B-34
- Gibbons vs. Ogden, in constitutional law U-212, T-125
- Gibbs, Arthur Hamilton (born 1888), American author, born London, Eng.; brother of Sir Philip Gibbs and Cosmo Hamilton; major in British army in 1st World War; became U. S. citizen after marriage to an American ('Gun Fodder', war biography; 'The Hour of Conflict', 'Soundings', 'Harness', 'Undertow', novels).
- Gibbs, James Ethan Allen (1829-1902), American inventor, born Raphine, Va. S-93
- Gibbs, Josiah Willard (1839-1903), American physicist, born New Haven, Conn.; professor of mathematical physics, Yale; one of leaders in field of thermodynamics and electromagnetics: C-179
- Gibbs, Sir Philip (born 1877), British journalist and novelist; brother of A. Hamilton Gibbs and Cosmo Hamilton; literary editor for several London papers; war correspondent with Bulgarian, French, Belgian, and British armies 1912-18; editor *Review of Reviews* 1921-22 ('The Street of Adventure'; 'Heirs Apparent'; 'The Middle of the Road'; 'Now It Can Be Told'; 'The Hidden City'; 'Ordeal in England').
- Gib'oon, ancient city of Palestine; probably existed on site of modern small village of El-Jib, 5 mi. n.w. of Jerusalem.
- Gibralt'ar, British naval base on Mediterranean G-86
caves C-118
- Gibraltar, Strait of, passage 40 mi. long, 9 to 15 mi. wide, between Spain and Africa, connecting Atlantic with Mediterranean, map S-226
- Gibraltar of America, Quebec Q-6
- Gibraltar of the East, Aden, Arabia A-20
- Gibraltar of the North Sea, Helgoland H-271
- Gibran (*ġī-brān'*), Kahlil (*kā'īl*) (1884-1931), Arabic - American writer and artist, born Lebanon, Syria; came to live in U. S. in youth; wrote first in Arabic, later in English; poetic and mystical in his writings, whether in prose or verse, and in his symbolical drawings ('The Prophet'; 'Jesus the Son of Man, His Words and His Deeds as Told and Recorded by Those Who Knew Him').
- Gibson, Charles Dana (born 1867), American illustrator, born Roxbury, Mass.; master of black and white drawing; skilful portrayer of society life; creator of the "Gibson girl."
- Gibson, John (1790-1866), British sculptor; introduced color after Greek fashion in tinted 'Venus' ('Sleeping Shepherd'; 'Mars and Cupid'; statue of Queen Victoria for Houses of Parliament)
in classic revival S-61
- Gibson, Katherine (born 1893), author of children's books, born Indianapolis ('Goldsmith of Florence', a book of great craftsmen; 'Golden Bird', ancient legends).
- Gibson, Wilfrid Wilson (born 1878), British poet ('Stonefolds'; 'Borderlands'; 'Neighbors', depicting inner life of working people).

ü=French u, German ü; ġem, ġo; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

- Giddings, Franklin H. (1855-1931), American sociologist, born Sherman, Conn.; professor sociology, Columbia University ('The Principles of Sociology'; 'The Scientific Study of Human Society').
- Gide (zhéd), André Paul Guillaume (born 1869), French essayist and novelist; fine stylist, keen psychological observer, liberal thinker ('The Counterfeiters'; 'Lafcadio's Adventures'; 'Travels in the Congo'; 'Strait Is the Gate') 'L'Immoraliste' F-198
- Gide, Charles (1847-1932), French economist; wrote much on coöperative movement in France and coöperation of intellectual workers in different countries.
- Gid'eon, religious reformer, judge, and mighty warrior; deliverer of Israel from the Midianites (Judges vi-viii).
- Gideons, popular term for members of the Christian Commercial Travelers Association of America; first group formed 1899 in Janesville, Wis.; publish monthly magazine; distribute Bibles to hotel rooms; also to army and navy.
- Giesecking (jē'zē-king), Walter (born 1895), German pianist, born Lyons, France, of German parents; toured successfully in England and U. S.; noted especially for artistic playing of Bach, Debussy, Schubert, and Schumann; also composed music very modern in style.
- Giffard (zhē-fār'), Henri (1825-82), French engineer, invented dirigible balloon run by steam B-23
- Gifford, Walter Sherman (born 1885), American industrial and civic leader, born Salem, Mass.; president, American Telephone and Telegraph Company; president, Charity Organization Society, New York; director, Council of National Defense during 1st World War; appointed by President Hoover, director of National Unemployment Relief, 1931; work in defense communication 1941.
- Gifts. See also in Index Foundations Christmas C-227-8 etiquette E-312a
- Gigantosaur'us, huge prehistoric animal A-206
- Gig-headed snipe, or woodcock W-133. See also in Index Woodcock
- Gigli (jēl'yē), Beniamino (born 1890), Italian dramatic tenor; began as choir boy; sang in opera in Italy; with Metropolitan Opera Co., New York; voice of beautiful quality.
- Gijon (hē-hōn'), Spain, port for rich mining district in center of n. coast on the Bay of Biscay; pop. 78,000; watering place: map S-226
- Gil, Emilio Portes. See in Index Portes Gil, Emilio
- Gila (hē'lá) Cliff Dwellings, national monument in New Mexico N-22
- Gila Desert, Ariz. U-182, picture-map A-289
- Gila monster L-171, picture L-171 feeding in captivity Z-223
- Gila River, broad and shallow stream 605 mi. long; rises in Sierra Madre Mts. in s.w. New Mexico and crosses Arizona to Colorado River: maps U-188b, A-289
- Coolidge Dam D-6b, picture D-7
- Gilbert, Sir Alfred (1854-1934), English sculptor and goldsmith; imagination and a marked sense of design and ornamentation shown in his works, which include idealistic groups, portraits, monuments, figurines, seals (Shaftesbury memorial fountain in Piccadilly Circus, London; statue of Queen Victoria for Winchester, England; memorial to Duke of Clarence).
- Gilbert, Cass (1859-1934), one of foremost American architects, born Zanesville, Ohio; designer of many famous buildings, including the Minnesota capitol, and the Woolworth Building and U. S. Custom House, New York City; planned University of Minnesota and University of Texas capitol, W. Va., picture W-75
- Gilbert, Henry Franklin Belknap (1868-1928), American composer; born Somerville, Mass.; studied at New England Conservatory of Music and with Parker and MacDowell; exponent of American music and believed national music must be founded on music of the people ('Comedy Overture on Negro Themes', 'The Dance on Place Congo', 'Indian Sketches').
- Gilbert, Sir Humphrey (1539?-83), English navigator, half-brother of Sir Walter Raleigh; seeking the Northwest Passage (1583), took possession of Newfoundland for Queen Elizabeth, first English colony in North America (though it lasted but a short time); lost at sea on return voyage: A-144
- Gilbert, Sir John (1817-97), English painter and illustrator; great historic themes of vigorous design and color: pictures H-277, H-339
- Gilbert, Seymour Parker (1892-1938), American lawyer and financial expert; born Bloomfield, N. J.; held unusual financial responsibility at early age; assistant secretary of treasury 1920-21; undersecretary of treasury 1921-23; agent general for reparations payments of Germany, 1924-30.
- Gilbert, William (1540-1603), English scientist, called "father of electric science" M-34, E-231
- Gilbert, Sir William S. (1836-1911), English humorist and playwright ('Pinafore', 'The Mikado', and other comic opera librettos set to music by Sir Arthur Sullivan; 'Bab Ballads') quoted P-268
- Gilbert and Ellice Islands Colony, British colony in Pacific including Ellice Islands, Fanning Island, Washington Island, Ocean Island, Christmas Island, Phoenix Islands, and Gilbert Islands; seat of government on Ocean Island; total area about 200 sq. mi.; pop. 35,000. See in Index names of islands
- Gilbert Islands, group of coral islands on Equator in mid-Pacific; 166 sq. mi.; pop. 25,000; under British protection since 1892; included in Gilbert and Ellice Islands Colony since 1915: map P-10b
- 2d World War W-179
- Gilbert Peak, in Uinta Mts., Utah (13,422 ft.), map U-264
- Gil Blas (zhēl blás), the hero of a famous novel ('The Adventures of Gil Blas de Santillane') by Le Sage. Serving 15 masters, he travels through Spain having many adventures. The book imitated the Spanish "picaresque," or rogue novel.
- Gilboa, N. Y., former village s.w. of Albany abandoned for the erection of Gilboa dam and reservoir. Remarkable fossil forest found there has been restored and transferred to state museum at Albany.
- Gilboa dam A-236
- Gilboa, mountain range in Palestine, scene of battle in which Saul and Jonathan were slain.
- Gilder, Richard Watson (1844-1909), American poet and editor, born Bordentown, N. J. ('Five Books of Song') sonnet P-270
- Gildersleeve, Virginia Crocheron (born 1877), educator, born New York City; professor of English at Barnard College 1900-11 and dean since 1911; known especially for work in broadening women's higher education.
- Gilding, use of gold leaf G-113-14 bookbinding B-182, picture B-183 sculpture S-53, W-138
- Gilds, or guilds G-87-8 apprentice system V-313 booksellers in medieval Paris B-180 Chinese, the Co-hong C-221j drama of Middle Ages D-93 educational influence E-172 flags F-84-5 Florence F-107 Freemasonry F-193 Middle Ages R-75-6: scribes in B-190
- Gilead (jīl'ē-ād), region east of the Jordan River; occupied by Israelites in ancient times; a fertile, mountainous district noted for spices, myrrh, and balm; located in what is now the British mandate of Trans-Jordan: P-37
- Gilead, balm of. See in Index Balm of Gilead
- Giles (jīls), Saint (6th century?), patron saint of beggars and cripples; hermit and Benedictine abbot of France; festival September 1.
- Gil'gal, ancient city in Palestine in Jordan valley between Jericho and river, where Israelites first encamped after crossing the Jordan (Joshua iv).
- 'Gilgamesh (jīl'jā-mēsh), Epic of', Babylonian poem B-10
- Gilia (jīl'i-ā or jīl'i-ā), a genus of plants of phlox family, found in western N. America; leaves lance-shaped or finely cut; flowers funnel-shaped or saucer-shaped in thimble-like heads. Thimble flower (*G. capitata*) has lavender blue heads; used as an everlasting; standing-cypress (*G. rubra*) grows to 6 ft., leaves needlelike; birds-eyes (*G. tricolor*), flowers bell-shaped, violet, shading brownish-purple to yellow.
- Gill (jīl), Eric Rowland (1882-1940), English sculptor and stone carver; work reflects a deeply religious spirit; famous for carving of Stations of the Cross in Westminster Cathedral; author of works on esthetics including 'Beauty Looks after Herself'.
- Gill (jīl), a unit of liquid measure, table W-67
- Gillette (jī-lēt'), William (1855-1937), American actor, stage manager, and playwright, born Hartford, Conn.; did notable work in 'The Admirable Crichton' and 'Dear Brutus'; most famous as actor in his own dramatization of 'Sherlock Holmes'; also wrote and acted in 'Held by the Enemy', 'Secret Service'; active in promoting naturalism on the American stage.
- Gillflower. See in Index Stock; Wallflower
- Gill-net F-81, picture F-81
- Gillot (jīl'öt), Joseph (1799-1873), English pen manufacturer P-104
- Gills (jīlz), organs for breathing under water crustacea: crab C-388; crawfish, picture C-391; lobster L-175 embryo vertebrates V-290: chick E-259; human E-341

- fish F-70, picture R-79: cartilaginous F-67
 mollusks: aquatic snails S-168;
 bivalves M-218, picture O-265;
 nautilus N-44
 tadpoles: frog F-207; salamander S-12, 13
- Gilman, Charlotte Perkins** (1860-1935), American writer and lecturer on labor and feminism ('Woman and Economics'; 'The Crux'; 'His Religion and Hers').
- Gilman, Daniel Coit** (1831-1908), American scholar and educator, born Norwich, Conn.; president of University of California and first president of Johns Hopkins University and of Carnegie Institution at Washington, D. C.
- Gilman, Lawrence** (1878-1939), music critic and author, born Flushing, N.Y.; on staff of *Harper's Weekly* 1901-13, *North American Review* 1915-23, *N.Y. Herald Tribune* 1923-39 ('Music and the Cultivated Man'; 'Toscanini and Great Music').
- Gilman, Nicholas** (1755-1814), American politician, born Exeter, N.H.; delegate to Congress from New Hampshire (1786-88); to Constitutional Convention (1787); Federalist member of Congress (1789-97); Jeffersonian Republican senator (1804-14).
- Gilmore, Patrick Sarsfield** (1829-92), American bandmaster, born Ireland; musical conductor at National Peace Jubilee, 1869, and World's Peace Jubilee, 1872; leader of famous 22d Regiment Band, New York City; sometimes wrote music under pen name Louis Lambert 'When Johnny Comes Marching Home' N-25
- Gilpin, John**, in Cowper's 'John Gilpin's Ride', a linen draper who has many ludicrous adventures on horseback C-386, 387
- Gilsonite**, a variety of asphalt A-337
- Gimbal** (*gim'bál*), in compass mountings C-326
- Gin**, a liquor A-112
- Gin**, cotton C-376, 380, pictures C-378, 380, W-95
 Whitney invents W-96
- Ginger**, a spice G-88, picture S-251
- Gingerbread tree**. See *Doum palm*
- Ginger family**, or *Zingiberaceae* (*zing-ġi-bēr-ā'sē-ē*), a family of plants including the ginger, shell-flower, spiral flag, curcuma, cardamon, and the ginger-lily.
- Gingham**, a cotton fabric woven in checks, plaids, stripes, or sometimes in plain colors.
- Ginkgo** (*gingk'gō*) family, or *Ginkgoaceae* (*gingk-gō-ā'sē-ē*), a family of trees, consisting of one genus, native to e. Asia, comprising the ginkgo tree G-88, T-137
- Ginseng** (*gin'seng*), a plant G-88-9
- Ginseng family**, or *Araliaceae* (*ā-rā-ŭ-ā'sē-ē*), a family of plants, shrubs, and trees found throughout the world, including the English ivy, ginseng, sarsaparilla, and Hercules club.
- Ginzberg, Asher**. See *Ahad Ha'am*
- Gloconda** (*gō-kōn'dā*), La', or 'Mona Lisa', painting by Leonardo da Vinci V-300, picture E-333
- Giolitti** (*gō-lēt'tō*), Giovanni (1842-1928), Italian statesman; several times premier of Italy; opposed Italy's participation in 1st World War.
- Giordano** (*gōr-dā'nō*), Luca (1632-1705), Italian painter, born Naples; painted with astonishing speed; called "Fa-Presto"; his numerous works show influence of the great masters of painting ('Christ Expelling the Traders'; 'Francis Xavier'; 'Judgment of Paris').
- Giordano, Umberto** (born 1867), Italian composer; studied under Verdi ('Andrea Chénier'; 'Fedora'; 'Madame Sans Gêne'; and other operas).
- Giorgione** (*gōr-gō'nā*), or *Giorgio Barbarelli* (1478-1510), Italian painter, of Venetian School; had profound influence on painters of his day; portraits, and religious and classical subjects ('Sleeping Venus'): P-16
- Giotto** (*gōt'tō*) di Bondone (1267?-1337), Italian painter, sculptor, and architect G-89-90, P-15
 famous shepherd dog I-167: bas-relief, picture I-173
 fresco at Padua G-90, picture P-15
 inspires modern painters P-24, 26
 portrait of Dante D-11
 tower in Florence I-167-8, G-89, pictures G-90, F-108
- Giovanni, Don**. See *Don Juan*
- Giovanni** (*gō-vā'n'ne*) de' Medici (died 1429), Florentine merchant; founded greatness of the Medici family: M-107
- Giovanni Pisano**. See *Pisano, Giovanni*
- 'Giovinezza'** (*gō-vē-nēt'sā*), Fascist hymn N-25
- Gipsy**, or *gypsy* G-90-1
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 Hungarian H-360
 music inspires Liszt L-156, G-90
- Gipsy moth**, a moth of the silkworm family B-286, I-89
 caterpillar, picture B-82
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 elm damaged by E-256
- Giraffe** G-91-2, pictures G-92, Z-220, 222, color plate A-36b
 ancestry F-163
 foot, picture F-147
 price paid by zoos Z-221
- Giralda** (*hē-rāl'dā*), a bell-tower at Seville S-86
- Girard** (*zhē-rār*), Jean Baptiste ("Le Père Girard") (1765-1850), Swiss educator; entered Franciscan Order; held that study should serve to stimulate the ability to think.
- Girard** (*gi-rār'd*), Stephen (1750-1831), American merchant, banker, and philanthropist P-159, P-118
- Girard College**, for orphan boys in Philadelphia; gives primary, grammar, and high-school education, with emphasis on vocational training; established 1848 by will of Stephen Girard; will stipulated no one officially connected with a church should even visit school, so that freedom of religious thought might be assured: P-159
- Girasol** (*gir-ā-sōl*), a blue-white precious opal with red play of color.
- Giraud** (*zhē-rō*), Henri Honoré (born 1879), French general, noted for military successes and escapes from German prisons in 1st and 2d World Wars; organized Fighting French forces in Algeria Nov. 1942, made high commissioner of French Africa Dec. 1942; co-chairman with De Gaulle of French Committee of National Liberation June-Nov. 1943; made commander in chief of French army Aug. 1943: W-179g
- Giraudoux** (*zhē-rō-dō*), Jean (born 1882), French writer and diplomat; graceful, impressionistic, original style ('Campaigns and Intervals', reminiscences of 1st World War; 'Bella', a political novel; 'Siegfried'; 'Amphytrion 38', play).
- Girder bridge** B-240
- Girdle of Venus**, long ribbon-like jelly-fish of Mediterranean; iridescent colors, luminescent at night.
- Girga** (*gēr-gā*), Egypt, town and former cap. of Upper Egypt, on Nile, 275 mi. s. of Cairo; pop. about 20,000: map E-197
 Coptic center E-196
- Girgenti** (*gēr-gēn'tē*), also *Agrigento*, city near s. coast of Sicily; pop. 30,000; famous ruins of Greek temples; ancient Agrigentum.
- Girl Guides**, British organization from which Girl Scouts developed G-93
- Girl Reserves**, in Y.W.C.A. Y-209
- Girls' clubs**. See in *Index* Camp Fire Girls; Four-H Clubs; Girl Scouts; Junior Red Cross
- Girl Scouts** G-93-5
 camping, pictures G-93, C-47b
- Gironde** (*zhē-rōnd*) River, estuary in s.w. France, 45 mi. long F-173, map F-179
- Gi rondists** (*gi-rōn'dists*), political party of French Revolution; advocated moderate republicanism
 Madame Roland R-127
 oppose Jacobins J-181
- Girty** (*gēr'ti*), Simon (1741-1818), American revolutionary renegade and Indian leader, to whom are attributed innumerable atrocities.
- Gish, Lillian** (born 1896), actress, born Springfield, Ohio; in motion pictures in 'The Birth of a Nation', 'The White Sister'; on stage in 'Camille', 'Life with Father'. Sister, Dorothy Gish (born 1898), also actress on stage and screen ('Nell Gwyn', 'Madame Pompadour').
- Gis'sing, George Robert** (1857-1903), English novelist, whose struggles with poverty are reflected in his writings; a keen realist ('New Grub Street'; 'The Whirlpool'; 'The Private Papers of Henry Ryecroft'. partly autobiographical).
- Gist** (*gist*), Christopher (1706-59), American scout and soldier, born Maryland; explored Ohio Valley 1749-52; said to have saved Washington's life while crossing Allegheny River.
- Gitschin** (*gitch'in*), or *Jicin*, town in Bohemia, Germany, 43 mi. n.e. of Prague; pop. 11,000; Prussian victory over Austrians 1866.
- Giuliano de' Medici** (*gō-lē-yā'nō dā* (*mā'dē-chē*) (1453-78), brother of Lorenzo de' Medici M-107
- Giuliano de' Medici** (1479-1516), duke of Nemours, 3d son of Lorenzo
 statue by Michelangelo F-107
- Giullo Romano** (*gō'lē-yō rō-mā'nō*) (1492?-1546), Italian painter and architect, known also as Jules Roman; pupil, assistant, and successor of Raphael as head of Roman School of painting
 'Dance of Apollo and the Muses', picture A-228
- Glurgevo** (*gōr-gā'vō*), Rumania, or *Giurgiu* (*gōr'gō*), port of Bucharest 35 mi. s. on Danube River; pop. 25,000; engagements in Russo-Turkish wars.
- "Give me liberty, or give me death" (Patrick Henry) H-280
- Gizeh** (*gē'zē*), Egypt, also *Giza*, town on Nile River nearly opposite Cairo; pop. 38,000: map E-197
 Great Pyramids P-371, C-16-17, pictures E-196, P-371, 372
 Sphinx S-248-9, picture S-248
- Gizzard**, last and most important of a bird's three stomachs; has muscular walls and grinds food with aid of gravel in seed and grain eaters; membranous sac in carnivorous birds; discharges prepared food into intestine for absorption.

ü=French u, German ü; ġem, ġo; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

Gjellerup (*yěll'ē-rup*), Karl (1857-1919). Danish poet and novelist; early disciple of Georg Brandes; wrote 'The Disciple of the Teutons', an anti-theological work, under his influence; later works showed deep spiritual and ethical strain; shared Nobel prize 1917, with Pontoppidan ('The Mill').

'Gjša' (*yū'ā*), Amundsen's ship F-283-4

Glace (*glās*) Bay, Nova Scotia, coal-mining center on n.e. coast of Cape Breton Island 15 mi. e. of Sydney; pop. 20,706; large fishing industry; map C-50c

early telegraph station C-80
Glacial acetic acid, acetic acid free from water, which forms icelike crystals at 62° F.

Glacial Age I-2-3. See also in Index Ice Age

Glacial drift G-96

Indiana I-45

Michigan M-154

Minnesota M-191

New York N-114

North America N-152

Ohio O-213

Wisconsin W-122

Glacial period I-2-3. See also in Index Ice Age

Glacial till G-96, I-2a

Glaciation, action of glaciers upon surface over which they travel G-95-6, I-2a-3

Glacier, a moving ice field G-95-6, pictures P-199, C-50, I-2a

Agassiz, Louis, work of A-45

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Antarctica A-214, 216-17, map A-215

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Franz Josef Glacier, New Zealand, picture G-95

glaciation G-95-6, I-2a-3

Glacier Bay monument N-22a

Glacier Park G-96, N-22-22a

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lakes formed by L-55, I-2a

Mt. Rainier N-19, picture I-2a

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Norway N-174

soil formation S-191

Switzerland S-353-7

Glacier Bay National Monument, s.e. Alaska N-22a, map A-105

Glacier bear B-68

Glacier National Park, in Montana; 1500 sq. mi. G-96, N-22-22a, picture N-16

Glacier National Park (Canada), park in s. British Columbia; has snow-capped peaks, glaciers, forests of Selkirk mountains, wild life: N-23

Glacier Peak, in northern part of Cascade Range, Wash.; 10,436 ft. Also mountain in n. cent. Colorado; height 12,654 ft.

Glackens, William J. (1870-1938), impressionist painter, born Philadelphia; remarkable colorist, fine sense of form and composition; influenced by Renoir and Manet; subjects include beach scenes, flowers, portraits, landscapes.

Gladden, Washington (1836-1918), American clergyman, social reformer, and author, born Pottsgrove, Pa.; directed attack on "tainted money" and opposed alliance of church with "predatory wealth"; urged personal responsibility of every citizen for good government.

Glad'iator, professional fighter in ancient Rome G-96, S-159-60, picture G-97

Gladiolus (*glād-i-ō'lūs*, formerly *glā-dī-ō-lūs*), flower G-96

Gladkof (*glād'kóf*), Feodor Vasilievich (born 1883), Russian novelist R-197, 198

Gladstone, William Ewart (1809-98), British statesman G-96-9
American Civil War, attitude G-98 anecdote H-236

Disraeli's rivalry with G-96

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Liberal party policies P-291

peerage refused by G-99

South African policy S-200

U. S. Constitution, quoted on U-209

Victoria's attitude V-296, D-71

Glaire, in bookbinding B-182

Glamorganshire (*glā-mōr'gān-shēr*), southernmost county of Wales; 733 sq. mi.; pop. 766,000; cap. Cardiff; great coal beds, iron manufactures; cattle, sheep, hogs.

Gland, in human body G-99-100. See also in Index Hormones

ductless G-99-100

gastric G-99, S-292

kidneys K-16

liver L-165

pancreas D-68, G-99

reflex reactions R-63, 64

salivary P-206

sebaceous S-157

sweat S-157

Glanders, an infectious disease, common among horses and asses, less frequently attacking cattle and other live stock; ulcers, pus discharge from lungs, and high temperature are characteristics.

Glarus (*glā'rus*), cap. of Swiss canton of same name, 43 mi. from Zurich; pop. 5000; cotton mills, breweries.

Glasgow, Ellen (born 1874), American novelist, born Richmond, Va.; feminist; work shows fine characterization; keen wit; clear, forceful language; awarded Pulitzer prize 1942 ('The Romance of a Plain Man'; 'Barren Ground'; 'The Romantic Comedians'; 'Vein of Iron').

Glasgow, Mont., town in n.e., on Milk River, 55 mi. s. of Canadian border; pop. 3799; center for shipping cattle, sheep, and grain; Fort Peck Dam near by; was home of Indian chief, Sitting Bull: map M-243

Glasgow, largest city of Scotland; pop. 1,090,000; on Clyde River G-100, S-44, map E-270a
Municipal Art Gallery G-100

Glasgow, University of, founded 1451 by Bishop Turnbull; coeducational since 1893; retains many medieval customs, including student election of rector; faculties of arts, science, medicine, divinity, law: G-100
James Watt at W-57

Glaspell, Susan (Mrs. Norman H. Matson) (born 1882), American novelist and dramatist, born Davenport, Iowa. With her first husband, George Cram Cook, helped organize Provincetown Players; wrote for them popular plays 'Suppressed Desires' and 'Trifles'. Pulitzer prize (1931) for 'Alison's House', play based on the life of Emily Dickinson.

Glass, Carter (born 1858), U. S. politician; born Lynchburg, Va.; member U. S. House of Representatives 1902-18; secretary of the treasury 1918-20; U. S. Senate since 1920
Federal Reserve Act F-21

Glass, Montague (1877-1934), American humorous author, born Manchester, England; best known for 'Potash and Perlmutter' stories dealing with Jewish clothing merchants.

Glass G-101-6
ancient G-101: Egypt E-204, G-101; Phoenician G-101

blowing G-102, 104, 106, pictures G-103, 105

building construction, picture A-272b

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cameo G-105-6, picture E-336

chimney for lamp invented L-57

Colonial A-173-4, pictures A-174, 175

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electric lamps, quantity of glass used for E-235

electrification explained E-220

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melting point, table F-194

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musical instrument, of bowls H-225

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refracts light L-126-7, 129

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sand and silica S-23, S-143: sand deposits A-295

shatterproof G-104

spun glass G-105

stained glass windows G-105, picture G-106

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Glass-bottomed boats, designed for the purpose of viewing marine life

Santa Catalina Island L-199

Glasses, eye-glasses, or spectacles S-240

lenses L-96-8

Glass fibers, spun glass G-105

Glass-ropes, picture S-260

"Glass shot," motion picture device M-282

Glass-snake, a legless lizard L-171, picture L-170

Glass-Steagall Banking Act R-146f

Glass wool G-105

Glastonbury (*glās'tōn-bēr-ī*), Eng-

land, town in Somersetshire, on

Brue River, 22 mi. s. of Bristol;

ruins of 12th century abbey;

"Glastonbury thorn," a variety

which flowers twice a year, said to

have sprung from a specimen

planted by Joseph of Arimathea,

who built here the first Christian

church in England.

Glauber (*glou'bēr*), Johann Rudolf (1604-68), German chemist, discovered (1658) medicinal properties of Glauber's salt.

Glauber's salt, a natural sodium sulphate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$); found in Europe, s.w. United States, especially in Utah, Arizona, and California, in mineral springs, and in sea water; used medicinally as cathartic: C-176b

how produced C-167a

mineral form M-183

Glaucium (*glq'si-um*), or horned-poppy, a genus of annual or perennial plants of the poppy family, native to Eurasia. Several hybrid species were developed by Burbank; foliage blue-white; succulent, flowers yellow, red, or purple; also called sea-poppy.

Glauconite, a mineral containing iron and potassium silicate M-184
New Jersey deposits N-92

Glaucous willow, or pussy willow W-104b-5

Glaze, glassy coating on pottery, etc. enameling E-263-6

feldspar used for F-22

pottery P-328-30, color plate facing

C-221g

tile B-239

Glaze ice I-2

Glazunov (*glä-zq-nôf'*), Alexander Constantinovitch (1865-1936), Russian composer, born St. Petersburg (Leningrad); studied under Rimsky-Korsakof; was teacher and later director, Conservatory at Leningrad; a gifted and prolific composer, one of leaders of modern Russian school; compositions for orchestra, stage, chamber music ('Stenka Razin'; 'The Forest'; 'The Kremlin').

Gleaning, gathering of grain left in fields by reapers.
story of Ruth R-202

Gleiwitz (*glî'vîts*), Germany, manufacturing city and mining center on Klodnitz River in Silesia, s.e. Prussia; pop. 115,000; metal goods, chemicals, glass, cement, paper.

Gleizes (*glêz*), Albert Leon (born 1881), French artist, born Paris; impressionist in early work, later cubist; one of first adherents to cubist movement (1911).

Glen'coe, Scotland, glen 60 mi. n.w. of Glasgow; wild scenery; massacre of Macdonalds by royal troops 1692.

Glen Cove, N. Y., residential suburb of New York City on n. shore of Long Island; pop. 12,415.

Glendale, Ariz., town 8 mi. n.w. of Phoenix; pop. 4855; center of agricultural area; cotton gins, flour and feed mills, fruit packing; water supply from Roosevelt Dam.

Glendale, Calif., residential and manufacturing suburb 7 mi. n. of Los Angeles; pop. 82,582; airplanes and airplane motors, lumber.

Glendower (*glên'dou-er*), Owen (1359?-1415?), Welsh chief, national hero; last independent Prince of Wales and leader of last war for Welsh independence: W-3

Glenn, Hugh (1788-1833), American trader and merchant; purveyor of supplies to frontier posts in Ohio valley; led hunting and trading expedition (1821) from mouth of Verdigris River to Santa Fe.

Glens Falls, N. Y., manufacturing city 47 mi. n. of Albany on Hudson River; pop. 18,836; shirts and collars, paper, cement; limestone quarries near by; falls and famous cave described in Cooper's 'The Last of the Mohicans': map N-114

Glenwood Springs, Colo., resort city and ranching center 60 mi. n.w. of Leadville; pop. 2253: map C-310

Glick, George Washington (1827-1911), American statesman, born Greencastle, Ohio; responsible for revised laws of Kansas (1868); made governor of Kansas 1882; Kansas selection for Statuary Hall.

Glidden, Charles Jasper (1857-1927), American businessman, born Lowell, Mass.; pioneer in development of telephone, automobile, airplane; installed at Lowell (1879) one of first telephone multiple switchboards.

Glider, motorless airplane A-68, 86-7, pictures A-66

use in warfare A-86-7

Wright brothers W-183-4

"Global war" W-178x

Globe, Ariz., county seat, about 80 mi. n. of Tucson; pop. 6141; 38 mi. from Roosevelt Dam; formerly an important copper-mining and cattle center; tourist trade: map A-289

Globe, representing surface of earth M-58-59, map G-32-3

time clock, picture W-40

Globe amaranth, an annual plant (*Gomphrena globosa*) of the amaranth family, native to tropics. Leaves soft, hairy; flowers clover-like, with stiff stems, purple, orange, white, or variegated; used as everlasting; sometimes called bachelor's button.

Globe artichoke A-316

Globefish, oceanic fish with power of inflation when attacked; becomes like a football with tail and beak attached; species found on east U. S. coast (*Spheroideus maculatus*), called "swelldoodle," "puffer," "eggfish"; closely related to the Porcupine-fishes which have the same power of inflation.

Globe-flower. See in Index Trollius

Globe Theater, old playhouse in London S-96, 100, pictures S-99, 100a

Globe thistle, a genus (*Echinops*) of perennial plants of the composite family; tall, erect; leaves toothed, spiny at edges, often hairy on underside; flower heads steel-blue or white: T-81

Globin, in blood B-157a

Glockenspiel (*glôk'ên-spêl*), or carillon, bells or metal bars on which tunes can be played: B-92, O-241

Glommen River, Norway, largest in Scandinavia; rises in Dovre Fjeld tableland, flows s. 350 mi. into Skagerrak, 50 mi. s.e. of Oslo.

Glon'oin, name given to nitroglycerin in medicine; used as headache remedy.

Gloos'kap, a North American Indian god F-136

Wolf-Wind and, story F-138-9

Gloriana (*glô-ri-â'nâ*), in Spenser's 'Faerie Queene', the queen of Fairyland; personified glory and represented Elizabeth as queen.

"Glorious City," Baghdad B-14-15

"Glorious Revolution of 1688," in English history, overthrew James II J-183

Glory-pea. See in Index Clanthus

Glottis, an opening between the vocal cords leading into the windpipe P-206

Gloucester, Humphrey, Duke of (1391-1447), youngest son of Henry IV; "protector" of throne during youth of Henry VI; charged with treason at time of death: L-104

Gloucester (*glôs'tēr*), English city on Severn River, 114 mi. n.w. of London; pop. 53,000; originally a

Roman camp; noted cathedral of Norman-Gothic architecture; varied industries: map E-270a

first Sunday school founded S-329

Gloucester, Mass., leading fishing port in U. S. and one of largest in world, on Cape Ann, 27 mi. n.e. of Boston; pop. 24,046; summer resort; artists' colony: map M-82

Kipling immortalizes fishing fleet K-24b

Gloucester, N. J., manufacturing city on Delaware River opposite Philadelphia; pop. 13,692; paper, textiles, dairy products, lumber.

Gloucestershire (*glôs'tēr-shēr*), county in s.w. England at head of Severn estuary; 1223 sq. mi.; pop. 356,000; dairying, woolen manufacturing; cap. Gloucester.

Glover, George W. (died 1843), first husband of Mary Baker Eddy E-156

Glover, John (1752-97), American Revolutionary soldier; rose from cobbler to brigadier-general; in charge of retreat from Long Island and of boats in which Washington crossed Delaware; member of court which tried Major André.

Gloversville, N. Y., in e. cent. part of state, 40 mi. n.w. of Albany; pop. 23,329; leading manufacturing city for gloves in U. S.; large tanneries, textile mills, woodenware factories

glove industry G-107

Gloves G-106-7

earliest in history A-252

manufacturing centers G-107

medieval, pictures T-68, G-27

rubber R-168

Glow-lamp P-179, 178

action explained E-242-3

sodium vapor lamps S-190

Glowworms and fireflies F-58-9

luminescence P-176

Gloxin'ia, a perennial plant of tropical America of the family *Gesneriaceae*; large bell-shaped flowers of velvety red, purple, white, or intermediate shades; garden plant known as gloxinia is of genus *Sinningia*.

Gluck (*glük*), Alma (1886-1938), American dramatic soprano, born Rumania; attained operatic and concert success without European training; married Efreim Zimbalist.

Gluck, Christoph Willibald (1714-87), German composer; earliest of great modern opera writers, and first to make opera truly dramatic, suiting the music to the character portrayed ('Iphigénie en Tauride'): O-228

Glucose (*glû'kôs*), also called dextrose, and grape sugar, a simple (mono-saccharide) sugar ($\text{C}_6\text{H}_{12}\text{O}_6$), three-fourths as sweet as cane sugar; differs from fructose in structure of molecule; commercially, term means corn syrup containing glucose and fructose: G-107, S-322
candy making G-107, C-71, 72
fermentation of Y-205
polariscope test L-131

Glucoside, a chemical found in plants L-90, C-419

Glue G-107-8

calcimine contains P-32a

colloidal nature C-302

potassium bichromate used C-231

Gluten (*glû'tên*), a tough, elastic albuminous protein P-356
barley lacks B-47

bread B-229

corn content C-368, chart C-366b

macaroni content M-1

wheat flour content F-118, W-81

Glutton, an Old World wolverine W-130

Glyc'erin, or glycerol G-108
base of nitroglycerin D-122
corn product C-366b
formed during digestion D-69
soap making S-175, 177
Glyceryl rosinate, a resin P-32b
Glycogen (*gl'kō-gēn*), animal starch
L-165, B-110
muscle fuel B-110, R-80
Glycols, generic name applied to di-
hydric alcohols; thick, sweet, color-
less ethylene glycol ($C_2H_4(OH)_2$),
the simplest type, is used in anti-
freeze solutions and in preparation
of nitrate for explosives.
Glyp'tal, a synthetic plastic P-246
Glyptodon (Greek, "fluted tooth"), a
very large extinct armadillo-like
animal of South America; attained
size of an ox; had very strong
limbs with short broad feet; teeth
were deeply grooved or fluted.
G-men U-223
Gnat (*nāt*), small insect G-108
Gnatcatcher, a bird of the kinglet
family K-22
Gneiss (*nīs*), laminated granite-like
rock M-184
Gnomes, or kobolds F-3
cobalt named for C-290
Scandinavian Tomte C-229a
Gnosticism (*nōs'ti-siz-m*), movement
within early Christian church
(flourishing in 2d and 3d cen-
turies); combined elements of
Christian, Jewish, Greek, and
Oriental philosophies; held knowl-
edge, obtained from revelation, not
faith, is key to salvation.
Gnu (*nū*), or wildebeest, a member of
the antelope family; found in
Africa; both male and female have
curved horns; head and neck resem-
ble buffalo; has stiff mane and long
coarse tail; average height about
4½ ft.; sometimes called "horned
horse": picture A-33
Goa (*gō'ā*), largest of the possessions
comprising Portuguese India; on w.
coast of India about 250 mi. s. of
Bombay; over 1300 sq. mi.; pop.
535,000; conquered by Albuquerque
in 1510; contains Panjim (Nova
Goa), cap. of Portuguese India:
maps A-332c, I-31
Goat G-108-9, picture S-337
"City of Rams," myth C-78
ibex I-1
leather L-85, G-107
milk M-172, G-109
pet, care as P-154, picture P-155a
sheep related to S-104
Goat, a sign of the zodiac Z-218
Goat, Rocky Mountain, an antelope
A-218, R-122, picture A-219
Goat-antelopes. See in Index Moun-
tain goats
Goat fish, or surmullet, family of mod-
erate-sized shore fish (*Mullidae*),
with flat oblong body, large scales,
and a pair of chin barbels for dig-
ging worms, etc.; inhabits warm
seas; superior food fish; color, gold
or red: picture F-67
Goat Island, in Niagara River N-138,
picture-map N-139
Goats-beard, a biennial plant (*Trago-
pogon pratensis*) of composite fam-
ily, native to Europe but common
wildflower in North America. Be-
long to same genus as the vege-
table salsify. Grows to 3 ft.; leaves
gray-green, grasslike. Flower heads
pale yellow, 2½ in. across; seeds
form a round feathery mass, sim-
ilar to dandelion; sometimes called
meadow salsify: picture N-29a
Goatskin L-85
parchment P-57
Goatskin churn, picture P-130

Goatsucker, family of birds (*Capri-
mulgidae*), includes nighthawk and
whippoorwill.

"Gob," slang term for an American
sailor; originated in the 1st World
War.

Gobelin (*gōb-lān'*) tapestries, fa-
mous French tapestries, made in
Paris; so named from a family of
dyers by name of Gobelin who
owned building in which tapestry
industry was established in 16th
century. The industry is now main-
tained by the French government.

Gobi (*gō'bē*), The, desert region in
central China; 260,000 sq. mi.; ele-
vation 3000 to 5000 ft.: A-328,
M-222b-c, maps C-211, A-332b,
M-222c, picture A-405
camels C-39
exploration E-344
place in desert chain S-4

Goblins, grotesque fairies, similar to
gnomes and kobolds; they are
sometimes evil and malicious and
sometimes only playful and tricky.

Goby, any of numerous, widely dis-
tributed, spiny-finned fishes con-
stituting family *Gobiidae*; having
wide, flat head, large mouth, and
ventral fins often united in funnel-
shaped disk; small and usually
marine; some species minute in size

mud-skipper M-296, 297, picture
M-296

Godard (*gō-dār'*), Benjamin Louis
Paul (1849-95), French com-
poser; works for orchestra, violin,
piano, songs, chamber music, operas
(*'Jocelyn'*).

Godavari (*gō-dāv'ā-rē*), large river
in s. India; rises n.e. of Bombay in
Western Ghats, flows 900 mi. s.e.,
entering Bay of Bengal by 7
mouths; navigable for 300 mi.

Goddard, Henry Herbert (born 1866),
American psychologist, authority on
feeble-mindedness; researcher, lec-
turer, writer; most widely known
study 'Kallikak Family'; professor
of abnormal and clinical psychol-
ogy, Ohio State University, since
1922.

Goddard, Robert Hutchings (born
1882), physicist, born Worcester,
Mass.; physics professor Clark Uni-
versity after 1919; noted for re-
search in rocket method for reach-
ing great heights
experiment with rocket F-62

'Goddess of the Tides, The', by John
Elliott, picture A-311

Gode'tia, a genus of ornamental herbs
of the evening primrose family;
chiefly hardy low-growing annu-
als (*Gode'tia grandiflora*); has nu-
merous pink or crimson flowers.

Go-devil, pipe line cleaner P-151

Go'dey, Louis Antoine (1804-78),
American publisher of first woman's
periodical in U. S., *Godey's Lady's
Book*, Philadelphia (1830-77).

Godfrey, of Bouillon (*bō-yōn'*)
(1060?-1100), leader in First Cru-
sade, and first Christian ruler of
Jerusalem; hero of Tasso's 'Jerusa-
lem Delivered': C-403, 404

Godfrey, Thomas (1704-49), Amer-
ican mathematician and astron-
omer, born Bristol, Pa.: P-118

Godhavn (*gōd'hāv-n*), settlement in
w. Greenland, map G-176

Godiva (*gō-dī'vā*), Lady (11th cent.),
legendary English heroine C-386

Godkin, Edwin Lawrence (1831-1902),
American journalist and author,
born in Ireland; editor of New
York *Evening Post* and *The Na-
tion*; vigorously opposed political
corruption.

Godman, John D. (1794-1830), Amer-
ican physician, anatomist, and nat-
uralist, born Annapolis, Md.;
taught anatomy, physiology, and
surgery; one of first in America to
prove that ether vapor had an-
esthetic power ('Anatomical Inves-
tigations'; 'American Natural
History'; 'Rambles of a Nat-
uralist').

Godowsky (*gō-dōv'skē*), Leopold
(1870-1938), Russian-American
pianist and composer, born Vilna
(Wilno); studied in Berlin, and in
Paris under Saint-Saëns; made ex-
tensive concert tours; director piano
department Chicago Conservatory,
1890-1900; director Master Piano
School of Imperial Academy, Vi-
enna, 1902-12; in U. S. after 1912;
noted for brilliant technique; para-
phrases of Bach, Chopin, Johann
Strauss; many original composi-
tions.

Godoy (*gō-doi'*), Manuel de (1767-
1851), Spanish duke of Alcudia and
Prince of the Peace, favorite of
Charles IV and his queen; virtually
dominated Spain during the imbe-
cile king's reign.

'God Save the King', British national
song N-24

Godthaab (*gōt'hāb*), settlement in
s.w. Greenland, map G-176

Godunof, Boris. See Boris Gudenof

God'win, Mary Wollstonecraft (1759-
97), English women's rights adv-
ocate; wife of William Godwin;
mother of Shelley's wife, Mary
'Vindication of the Rights of Women'
W-132

Godwin, Parke (1816-1904), American
journalist, essayist, and editor, born
Paterson, N. J., for years with New
York *Evening Post*; compiled two
biographical encyclopedias; wrote
'Out of the Past'; 'Vala'; 'Political
Essays'.

Godwin, William (1756-1836), Eng-
lish political writer, novelist; radi-
cal believer in freedom, power of
reason ('Inquiry concerning Political
Justice'); married Mary Woll-
stonecraft, 1797; inspired young
men, notably Bulwer-Lytton, and
Shelley, who married Godwin's
daughter, Mary; many financial dif-
ficulties (novels, 'St. Leon'; 'Adven-
tures of Caleb Williams').

Godwin-Austen, Mount, peak in Him-
alaya Mts.; probably exceeded in
height only by Mt. Everest; altitude
28,250 ft.; named for English geol-
ogist; also called K 2, Karakorumor,
and Dapsang.

Godwine, Earl of Wessex (died 1053),
most powerful man in Britain of
his day; favorite of Canute; helped
raise Edward the Confessor to Eng-
lish throne.

Godwit, a curlew-like shore bird of
the snipe family, picture N-33

Goebbels (*gōb'bēls*), Paul Joseph
(born 1897), German Nazi leader;
minister of propaganda 1933-.

Goering (*gō'rīng*), Hermann Wilhelm
(born 1893), German Nazi leader,
active in "blood purge" 1934; pre-
mier of Prussia, minister of avia-
tion, president of Reichstag, chief
of secret police, field marshal, mar-
shal of the Reich: G-76b

Goes (*kōs*), Hugo van der (1440?-
1482), Dutch painter of early Neth-
erland school; most important work
Portinari altarpiece, now in the
Uffizi Gallery, Florence.

Goethals (*gō'thālz*), George Washing-
ton (1858-1928), American army
officer and engineer of Panama
Canal G-109, P-46

Goethe (*gō'tē*), Johann Wolfgang von (1749-1832), German poet, novelist, and philosopher G-109-10
 birthplace F-189, picture G-110
 'Faust' F-20, G-109-10, P-368b
 home and monument in Weimar W-69-70
 quoted on Shakespeare S-100c
 statue in Rome, picture G-61
 Goffe (*gōf*), William (1605?-1680?), one of judges who signed death warrant of Charles I of England
 hiding place at New Haven N-88
 Gog and Magog, in Bible, names of a king and his land (Ezek. xxxviii-xxxix), also of leaders in last battle against Christ's followers (Rev. xx); also two huge wooden statues in London Guildhall.
 Gogebie (*gō-gē'bik*) Range, iron range in Michigan, Wisconsin, map G-147
 Gogh (*gōk*), Vincent van (1853-90), Dutch artist (post-impressionist); from art dealer and evangelist turned to painting, first in dull browns and blacks, later in vibrant and luminous colors; illness and intense melancholia led to suicide 'L'Arlesienne', picture P-26
 Go'gol, Nikolai Vasilievich (1809-52), Russian novelist and dramatist; called "father of modern Russian realism": R-197, picture R-196
 influence on modern novel N-183
 'Going to Market', painting by Troyon, picture P-23
 Goiter (*gō'tēr*), an enlargement of the thyroid gland; measurement of the basal metabolism is used in diagnosis: G-99, B-118-19
 diet: fish F-82; iodized salt in I-118
 Goleonda (*gōl-kōn'dā*, Indian *gōl'kōn-dā*), India, ruined city 5 mi. w. of Hyderabad; diamond-cutting center in 16th century; name hence used to mean a rich mine: map I-30
 Gold, a metallic chemical element G-111-14, C-176, table C-168. See also Gold rush; Gold standard; and topics beginning with Gold
 alloys A-132-3, G-112-13
 carats and fineness G-113
 colloidal suspension C-303
 crystal, picture C-409
 currency M-219-22
 dissolved by aqua regia G-114
 ductility G-114
 electrical conductivity E-221
 electrochemical activity E-239
 electroplating E-243
 "fool's gold" or pyrite M-182
 green gold A-133
 illumination of books B-178
 imitation, pinchbeck A-133
 industrial uses G-113-14: ruby glass G-102
 leaf G-113-14
 malleability G-113
 melting point, table F-194
 metal work M-123: Italian, salt cellar, picture M-124; Mayan A-147; Peruvian, picture M-125
 mining and refining G-111-13, M-186, 188, M-122, pictures G-112, 113, M-187
 deepest mine G-111
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 hydraulic G-112, pictures A-102, G-113
 placer G-111-12, picture A-371
 monetary M-219-22: legal standard and value G-113, M-219; reserve in U.S. M-222
 native mineral M-182
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 Australia A-370, M-110-11, pictures A-369, 371
 Canada: British Columbia B-246, 247; Ontario O-227; Yukon Y-214
 East Africa E-138
 Fiji F-33

Philippine Islands P-169
 South Africa G-111, J-221, S-201
 South America: Bolivia B-170; Brazil E-226, G-111
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 United States G-111, U-195: Alaska A-100, A-103-4; California C-30, 34-5; Colorado C-309, 311, 314; Nevada N-77; Oregon in 1849 O-248; South Dakota S-218-19
 production to present time G-111
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 symbols, chemical, picture C-167a
 uses G-113-14
 weight G-111: compared with other metals I-134
 white gold A-133
 wire and lace G-114
 Gold-beating G-113
 Goldberger, Joseph (1874-1929), American public health official and medical research worker, born Austria-Hungary; emigrated to New York City in 1880; surgeon in U.S. Public Health Service 1912-29
 discovers pellagra-preventive V-312
 Gold bonds S-291
 Gold certificates, paper money, table M-221
 Gold chloride G-114
 Gold Coast, a block of country under British government in w. Africa extending 334 mi. along Gulf of Guinea; 91,843 sq. mi.; includes Gold Coast Colony, Ashanti, Northern Territories, and British mandate of Togoland; pop. 3,165,000; cocoa, gold, diamonds, manganese, kola nuts, timber: A-34, map A-42a
 Gold Coast Colony, British colony, part of Gold Coast country in w. Africa; cap. Accra; 23,937 sq. mi.; pop. 1,600,000: map A-42a. See also in Index Gold Coast
 Gold dredging G-112, pictures G-113, D-103
 Gold-dust, a spring flowering perennial (*Alyssum saxatile*) of the mustard family, native to Europe. Low growing, with grayish leaves; flowers golden-yellow, in clusters; used in rock gardens; also called golden-tuft, basket-of-gold, or rock madwort.
 "Gold" employees, in Panama P-46
 Golden, Colo., city 14 mi. w. of Denver; pop. 3175; brewery, pottery works; Colorado School of Mines.
 Golden Age
 American literature A-178-80
 Athens P-125-6
 France F-196-7
 Holland N-72
 Italian literature I-154
 Latin literature L-68
 Roman Empire M-63
 Saturn S-31
 Spain and Spanish literature S-236
 Golden apples, in mythology
 Atalanta and A-352
 awarded by Paris to Aphrodite T-142-3
 of Hesperides H-282
 'Golden Ass' (Latin *De Asino Aureo*), satirical romance by Lucius Apuleius; concerns the adventures of one Lucius who is transformed into an ass; thus disguised he observes the preposterous behavior of mankind until, enlightened by his experiences, he emerges a new man; story includes the well-known fairy tale 'Cupid and Psyche'.
 Golden aster A-339
 Golden-bell. See in Index Forsythia
 'Golden Bough, The'. See in Index Frazer, Sir James George
 Golden Bull, originally any charter with golden seal or bulla; espe-

cially edict issued 1356 by Emperor Charles IV: G-72
 Golden Calf, image made by Israelites from their earrings at instigation of Aaron while Moses was absent on Mt. Sinai receiving the Ten Commandments (Exodus xxxii).
 Goldenchain, a tree. See in Index Laburnum
 Golden Circle, Knights of the C-256
 Golden-crowned kinglet K-22
 Golden digger, a solitary wasp (*Ammobia ichneumonea*); hunts grasshoppers and stocks them in an underground nest as food for its larvae: color plate W-32a-b
 Golden eagle E-123, picture E-123
 scientific name E-125
 Golden-eardrops. See in Index Di-centra
 Golden Fleece, sought by the Argonauts A-281, 282
 Golden Fleece, Order of the, order of knighthood in imperial Austria and royal Spain; membership limited to 24 knights exclusive of sovereign; independent branches in Austria and Spain after 1700; Austrian order discontinued 1919, Spanish 1931.
 Golden Gate, channel about 2 mi. wide, entrance to San Francisco Bay, Calif. S-24, 25, 26
 bridge B-240b, pictures B-242, S-24, 25, table B-342
 Golden Gate International Exposition, at San Francisco (1939-40) F-5, S-25, 26, pictures F-4a
 Golden Gate Park, San Francisco S-25
 Golden Gloves Tournament B-212
 Golden glow, a perennial plant of the genus *Rudbeckia* of the composite family with showy yellow or orange flower heads; also called cone-flower.
 Golden ground beetles, picture B-81
 Golden Hill, battle of, in New York N-122
 'Golden Hind', Drake's ship D-90
 Golden Horde, Tatars who overran Russia in 13th century M-223
 effect on Russian literature R-196
 Golden Horn, harbor of Istanbul I-152, pictures I-153, T-162
 Golden-leaved chinquapin, or giant chinquapin C-222
 Golden Legend, The, ecclesiastical work of 13th century by Jacobus de Voragine in 177 sections descriptive of saints' days in Roman calendar.
 Golden moss. See in Index Stonecrop
 Golden Pavilion, at Kyoto, a Japanese castle J-197
 Golden pheasant, picture P-157
 Golden plover P-259
 migration M-163-4, picture-map M-164
 Goldenrod G-115
 latex from R-169a
 Golden Rose, a papal honor D-35
 Golden Rule, "Whatsoever ye would that men should do to you, do ye even so to them, for this is the law and the prophets" (Matthew vii, 12, and Luke vi, 31).
 Goldenseal, or orange-root, a low perennial herb (*Hydrastis canadensis*) of the crowfoot family, with thick yellow rootstock and hairy stem terminated by a single greenish-white flower; widely used in medicine.
 Golden State, popular name for California C-25
 Golden Triangle, section of Pittsburgh P-225, 226, pictures P-225
 Golden trout T-145
 Golden wattle A-371

Goldfield, Nev., mining town; had great boom in early 20th century; N-78, map N-77

Goldfinch, wild canary F-35, pictures F-35, color plate B-138; nest lined B-126

Goldfish G-115

Goldie, John (1793-1886), Canadian botanist, born Ayrshire, Scotland; did research in Canada, United States, and Russia; settled in Canada 1844; a fern which he identified, *Aspidium goldianum*, was named after him.

Golding, Louis (born 1895), English writer, born Manchester; inveterate traveler; writes vividly, vigorously, and in rich style ('Sorrows of War', 'Prophet and Fool', verse; 'Sunward', 'Sicilian Noon', 'Those Ancient Lands', travel books; 'Day of Atonement', 'Magnolia Street', 'Five Silver Daughters', 'Mr. Emmanuel', novels; 'The World I Knew', reminiscences).

Gold lace G-114

Gold leaf G-113-14

Gold leaf electroscope. *See in Index* Electroscope

Goldman, Edwin Franko (born 1878), American conductor and composer, born Louisville, Ky.; organized Goldman band, New York, 1918.

Goldman, Emma (1869-1940), American anarchist, born Russia; co-publisher of *Mother Earth*, anarchist monthly; deported from United States to Russia, 1919; left Russia about 1921; died in Toronto, Canada and buried, at her request, in Chicago, Ill., beside comrade anarchists of Haymarket Riot of 1886 ('Living My Life').

Goldmark, Karl (1830-1915), Austrian composer, born Hungary ('Sakuntala', 'Penthesilea', 'In Springtime', compositions for orchestra; 'Queen of Sheba', 'Cricket on the Hearth', operas).

Goldmark, Rubin (1872-1936), American composer and teacher of music, born New York City, nephew of Karl Goldmark ('Samson', symphonic poem; 'Hiawatha', 'A Negro Rhapsody', overtures).

Goldoni (*göl-dō'nē*), Carlo (1707-93), Italian dramatist, founder of modern Italian comedy; 'The Coffee House' and 'Pamela' are his best; also wrote plays in French.

Gold point, in economics F-153

Gold Range, a range of Rocky Mts. in s.e. corner of British Columbia map C-58

Gold rush

Alaska and Klondike A-103-4, Y-214

British Columbia B-247

California S-1, C-34-5, D-22

Colorado C-309, 314

Idaho I-10

Nevada N-78

Goldsboro, N.C., commercial center in fruit, grain, and cotton region on Neuse River, 48 mi. s.e. of Raleigh; pop. 17,274; cotton yarn, cottonseed and soybean products, furniture, brick: map N-156

Goldschmidt (*göll'shmīt*), Jenny Lind. *See in Index* Lind, Jenny

Goldsmith, Oliver (1728-74), English novelist, essayist, and poet, author of 'The Vicar of Wakefield' G-115-16

children's books L-157-8

Dr. Johnson and, pictures J-225, C-347b

in London L-187

puppet story P-368b

Goldsmith beetle, large yellow nocturnal beetle (*Cotalpa lanigera*) similar to common dung beetle;

common in eastern United States; fond of willow trees; name also applied to other species of the subfamily Rutelinae.

Goldsmithing. *See also in Index* Metal work

Byzantine reredos, St. Mark's B-290

Gold standard, use of gold alone for monetary standard, as opposed to use of gold and silver or of irredeemable paper M-221

adopted in U. S. (1900) M-15

bimetallism M-220b

Bryan opposes M-14, B-254

foreign exchange F-153

franc stabilized F-182

"managed" money M-222, R-146h

monetary gold reserve in U.S. M-222

Populist attitude M-14

Sherman Silver Purchase Act H-229

silver demonetized in U. S. G-133

"Specie Circular" (1836) J-179

supported by: Cleveland C-267;

Hayes H-252

suspended in U.S. R-146h

Gold Star, U. S. Navy D-31

Gold Star Mothers. *See in Index*

American Gold Star Mothers

Gold Star Mother's Day H-322

Goldstein, Eugene (1850-1930), German physicist, professor at University of Berlin; discovered "canal rays" or positive rays.

Goldstone, aventurine, or sunstone, a semi-precious stone G-28

Goldthread, a low perennial herb (*Coptis trifolia*) of the crowfoot family having evergreen leaves and small white or yellow flowers; a tonic medicine is extracted from its bitter root, also a yellow dye.

Gold'tit, or verdin, small bird of the titmouse family (*Auriparus flaviceps*) common in s.w. United States; resembles chickadees and warblers in habits; ashy above; white underneath with golden head; makes nest woven of twigs.

Go'lem, man-machine A-384

Golf G-116-19

bibliography H-313c

club heads G-118: stainless A-130

cost, in U.S. L-93c

Golgotha (*gōl'gō-thā*), or Calvary, place where Jesus was crucified J-212, 214

Goliad, Tex., city and county seat of Goliad county; 134 miles s.e. of Austin; pop. 1446; over 300 Americans massacred by Mexicans, March 27, 1836; 18th-century mission and presidio.

Goli'ath, Philistine giant (I Samuel xvii) D-19

Goliath beetle, a large beetle of the family Scarabaeidae B-82

Gollancz (*gōl'āns*), Sir Hermann (1852-1930), English rabbi, educator, biblical scholar, and social worker; professor of Hebrew, University College, Oxford; knighted 1923; author of many books and of translations from Hebrew and Aramaic.

Gollancz, Sir Israel (1864-1930), British scholar; brother of Sir Hermann; professor of English literature, King's College, University of London; editor and translator of many Old and Middle English texts and authority on Shakespeare.

Golschmann, Vladimir (born 1893), Franco-American musical conductor, born Paris; founded Golschmann Orchestra, Paris; became conductor St. Louis Symphony Orchestra 1934.

Goltz, Colmar, Baron von der (1843-1916), Prussian general and military writer; reorganized Turkish army 1883-95; governor general

of Belgium, 1914; commanded Turkish army in Mesopotamia 1915-16 ('War History of Germany in 19th Century'; 'The Nation in Arms').

Gomel, Russia, manufacturing and railroad center and river port on branch of Dnieper River, 350 mi. s.w. of Moscow; pop. 145,000: map E-326e

Gomes (*gō'mās*), Antonio Carlos (1839-96), Brazilian composer; pupil of Rossi, Milan Conservatory; director Para Conservatory; wrote operas 'Il Guarany', 'Salvator Rosa', 'Maria Tudor', choral and piano works.

Gómez (*gō'mēs*), Estevan (or Estevão) (1470?-1530?), Portuguese explorer; sailed with Magellan in 1519, but led mutiny on the *San Antonio* and returned to Spain; sent by Charles V to seek Northwest Passage and explored part of North American coast: A-144

Gómez, Juan Vicente (1859-1935), Venezuelan politician; a mountaineer and rancher, he came quickly to power under Gen. Cipriano Castro through his fighting ability; president for many terms and virtual dictator; leading authority in Venezuelan affairs for over 20 years: V-277, 274

Gómez y Baez (*ē bū'ās*), Máximo (1831?-1905), Cuban patriot general; commander in chief (1895-98) in insurrection against Spain.

Gomor'rah and Sodom, in Biblical geography, cities in Palestine destroyed for wickedness A-4

story of Lot's wife A-4

Gompers, Samuel (1850-1924), American labor leader G-119

Council of National Defense W-168

Gomphrena (*gōm-frē'nā*). *See in Index* Globe amaranth

Gona, New Guinea. *See* Buna

Gonaives (*gō-nā-ēv'*), Gulf of, on w. coast of Haiti H-198

Goncharof (*gūn-chā-rōf'*), Ivan Alexandrovitch (1812-91), Russian novelist, wrote 'Oblomov', which gave Russia the term "Oblomovism" as a synonym for weak will and indolence.

Goncourt (*gōn-kōr'*), Edmond de (1822-96), French novelist and historian; in collaboration with his brother Jules (1830-70) wrote minute valuable studies of French society; novels continued realistic method of Flaubert and taught Zola ('Germinie Lacerteux', called "the clinic of love"; 'Renée Mauperin', a story of young Parisian society girl; 'Madame Gervaisais', study of mysticism): F-197

Goncourt, Académie des, French literary assembly established by terms of will of Edmond de Goncourt, 1896, for encouragement of independent art among young writers; to consist of 10 members; annual prize given for best novel, historical work, or collection of short stories.

Gondar (*gōn'dār*), religious center and former capital of Ethiopia, Africa, in the n. 250 mi. from Red Sea, map E-308

Gondoko'ro, Egypt, village on Upper Nile; formerly center of slave and ivory trade.

Gon'dola, long narrow Venetian boat, pictures V-278, B-251

Gonds, an aboriginal race of India, who maintained independence until 18th century; present Central Provinces correspond roughly to their kingdom: I-34

Goneril, one of King Lear's two cruel daughters, in Shakespeare's tragedy K-22

Góngora y Argote (*gōn'gō-rā ē ār-gōt'ē*), Luis de (1561-1627), Spanish poet and priest; from comparatively simple ballads and satires he turned to elaborate and obscure poems, which gave rise to term "Gongorism."

Goniometer, an instrument for measuring angles.

Gonsalvo de Córdoba (*gōn'sāl-vō dā kōr'dō-bā*) (Gonzalo Hernandez y Aguilar) (1453?-1515), Spanish general whose many conquests made him famous throughout Europe; secured possession of Naples to Spain but lost popularity with Spanish king toward close of his life.

Gonzaga University, at Spokane, Wash.; Roman Catholic institution for men, founded 1887; arts and sciences, education, engineering, law, music, business administration, graduate school.

Gonzales (*gōn-sālās*), Manuel (1833-93), Mexican general, close friend of Diaz, whom he aided in revolution of 1876; succeeded Diaz as president 1880-84, when he resigned in his friend's favor; brilliant general but poor administrator.

Goobar, a peanut P-94-5

Good, James William (1866-1929), U. S. secretary of war under President Hoover; born Cedar Rapids, Iowa; congressman from Iowa 1909-23.

Good Council College, at White Plains, N.Y.; Roman Catholic institution for women, founded 1923; arts and sciences.

Good Feeling, Era of, in U. S. history M-241

Good Friday E-140

"Good gray poet," Whitman W-95

Good Hope, Cape of. *See in Index* Cape of Good Hope

Goodhue, Bertram Grosvenor. (1869-1924), American architect, born Pomfret Hill, Conn.; designed churches, cathedrals, and chapels in which Gothic was adapted to modern methods of construction (his last and probably greatest being the University of Chicago chapel); used sculpture as integral part of building rather than surface ornament; for Nebraska state capitol conceived design not only impressive but unique among buildings of this type.

"Good King Robert," title given to Robert Bruce, of Scotland B-252

Goodman, Benny (born 1909), clarinetist, orchestra conductor, born Chicago, Ill.; remarkable for versatility, having won fame both as conductor of popular music and "swing" concerts and as clarinet soloist with symphony orchestras.

Good manners E-310-13. *See also in Index* Etiquette

"Good name, in man or woman" O-254

"Good Neighbor Policy," of United States toward Latin America L-670-2, M-242

"Good Queen Bess" E-254

Goodrich, Benjamin Franklin (1841-88), American physician and industrialist, born Ripley, N. Y. Akron, Ohio, rubber factory A-95

Goodrich, Samuel Griswold ("Peter Parley") (1793-1860), American author; best known for his school histories and other juvenile works.

Goodspeed, Edgar Johnson (born

1871), classical Greek and Biblical scholar, born Quincy, Ill.; professor at University of Chicago 1898-1937; with J. M. P. Smith translated the Bible into modern English ("The Story of the New Testament"; "New Solutions of New Testament Problems").

Good Templars, International Order of, Society to promote world-wide prohibition of liquor and total abstinence for the individual; organized Syracuse, N. Y. 1851; prohibition party and Woman's Christian Temperance Union grew from it.

Good will, the reputation, good standing, esteem and public confidence in an organization, which in the transfer of a business can be sold like any other property.

"Good-Will" flight, around Central and South America, picture A-72

Goodwin, Nat. C. (1857-1919), American actor, one of the most popular of his day, known for his dry, humorous characterizations.

Goodwin Sands, a range of dangerous shoals off s.e. coast of England, at entrance to Straits of Dover, scene of many wrecks; its shifting sands separated from mainland by the anchorage of Downs.

Goodyear, Charles (1800-60), inventor, born New Haven, Conn.; discoverer of process of vulcanizing rubber: R-164, picture I-115

Goodyear, Charles, Jr. (1833-96), industrialist, born Germantown, Pa., son of the preceding; promoted development of weltshoemachinery.

Goodyear dirigible, picture A-66

Goodyear welt, in shoes S-132

"Goody Two-Shoes, History of", a children's story supposed to have been written by Oliver Goldsmith L-158

Goofah, circular basket-like boat B-165, picture B-162

Goose, Elizabeth, supposed original of "Mother Goose" M-272

Goose G-119-20, picture E-145j

incubation period B-128
length of life, average, pictograph A-198

migration G-120, picture-map M-163
nest, picture N-33

pasturing in Europe P-338

Gooseberry G-120

host of white pine blister rust R-199

"Gooseberry, Mr.," name for French fur-trader Groseilliers F-224-5

Goosefish, or angler fish, picture F-69
Goose flesh, or goose pimples, cause of S-157

Goosefoot. *See* Lamb's quarters

Goosefoot family, or Chenopodiaceae (*kē-nō-pō-dī-ā'sē-ē*), a family of plants and shrubs including salt-bush, orach, quail-bush, beet, mangel, wormseed, mock cypress, spinach, winter fat, and Russian thistle.

Goose Lake, on boundary of California and Oregon; about 30 mi. long and 10 mi. wide: map C-28
water level, change D-113a

Goos'sens, Eugene (born 1893), British composer and conductor, born London; studied in Bruges, Liverpool, London; operatic and orchestral conductor in England, and in Rochester, New York City, and Cincinnati; belongs to modern school of British composers; opera "Judith"; orchestral, instrumental, and vocal works.

Gopher (*gō'fēr*), a rodent G-120-1

Gopher State, popular name for Minnesota.

Gopher tortoise T-166

Gorbodue (*gōr'bō-dūk*), mythical king of Britain; subject of first English tragedy. *See in Index* Dorset, Earl of

Go'dian knot A-114

Gordon, Adam Lindsay (1833-70), one of most popular and distinctive of Australian poets A-375

Gordon, Anna Adams (1853-1931), American temperance worker, born Boston, Mass.; secretary to Frances E. Willard 21 years; president International Woman's Christian Temperance Union ("Songs for Young Americans"; "Life of Frances E. Willard"; "Toots, and Other Stories" for children).

Gordon, Charles George (1833-85), British army officer ("Chinese Gordon") G-121

Kitchener avenges massacre of K-26

Gordon, Charles W. (1860-1937), Canadian missionary and novelist; pen name Ralph Connor: C-66

Gordon, Lord George (1751-93), English agitator; headed anti-Catholic movement which resulted in "Gordon Riots" of 1780.

Gordon, George Angier (1853-1929), American Congregational clergyman, born Scotland; pastor, Old South Church, Boston, 1884-1927; university preacher to Harvard and Yale.

Gordon, John Brown (1832-1904), American Confederate general, later governor of and senator from Ga.; born Upson County, Ga.; lecturer on Civil War subjects; author of "Reminiscences of the Civil War".

Gordon, Judah Loeb (1830-92), Russian-Hebrew writer, born Wilno; called "poet laureate of the Haskalah (movement for Jewish enlightenment)"; wrote lyrics, idylls, satires.

Gordon riots, precipitated in London on June 2, 1780 by a mob led by Lord George Gordon; caused by objections to repeal in 1778 of Catholic penal laws; Roman Catholic chapels and houses of magistrates were plundered and burned, Newgate prison was wrecked and prisoners liberated.

Gordon setter, a hunting dog D-83

Gordy, Wilbur Fisk (1854-1929), American educator and historian, born near Salisbury, Md. ("A School History of the United States"; "Colonial Days"; "Leaders in Making America").

Gore, Francis (1769-1852), Canadian lieutenant governor of Upper Canada 1806-17; born Kent, England.

Gore-Booth, Eva (1872-1926), Irish author; well known for "The Perilous Light" and other poems; in poetic drama "The Death of Fionavar" she pleaded for peace ("House of Three Windows"; "Shepherd of Eternity").

Gorgas (*gōr'gās*), William Crawford (1854-1920), American army officer and sanitary engineer G-122-3
Panama Canal P-46, G-122

Gorge, defined P-201

Gorges (*gōr'gēs*), Sir Ferdinando (1566?-1647), British colonist, founder of Maine, called "father of English colonization in America" in Maine M-40

in New Hampshire N-88

Gorgias (*gōr'gi-as*) (about 480-380 B.C.), Greek orator and sophist noted for florid eloquence; one of Plato's dialogues is named for him.

Gorgons (*gōr'gōnz*), in Greek mythology, three female monsters P-127, 128

Gorgonzola (*gôr-gônt-sô'lû*), town in Lombardy, Italy, center of cheese-producing district.

Gorgonzola cheese C-164

Gorilla, the largest of the apes G-123, pictures G-123, Z-221, A-203 care of in captivity Z-223 hand, picture A-225 price paid for by zoos Z-221 resemblances to man A-225

Gorizia (*gô-rêt-sê-ä*), Italy, 20 mi. n.w. of Trieste; pop. 47,000; capital of former Austrian crownland of Gorizia and Gradisca; ceded to Italy by Treaty of Rapallo (1920) Italians capture W-159, 160

Gorky (*gôr'ki*), Maxim ("Maxim the Bitter"), Alexis Peshkof (1868-1936), Russian revolutionist, short-story writer, dramatist, and novelist, born Nijni-Novgorod; obliged to earn own living at age of nine; wrote realistically of the oppressed and outcasts of society: R-197 chief works R-198, D-98

Gorky, also Gorki, Russia, formerly (until 1932) Nijni-Novgorod, trade and manufacturing center in e. on Volga River, 255 mi. n.e. of Moscow; pop. 645,000: map E-326e fairs R-182, F-3, picture R-188

Görlitz (*gôr'lits*), Germany, wealthy industrial town of Silesia on Neisse River, 55 mi. e. of Dresden; pop. 92,000: map G-66

Gorm, the Old (860?-935?), king of Denmark D-53

Gorman, Willis (1816-76), American lawyer, soldier, and 2d territorial governor of Minnesota (1853-57); served in Mexican war and was made brigadier general for distinguished services in Civil War.

Gorrie, John (1803-55), American physician, born Charleston, S. C.; settled in Apalachicola, Fla. 1833; invented method of mechanical refrigeration; obtained patent in 1851; applied principle to cooling sickrooms and hospitals; statue presented to Statuary Hall 1914 by state of Florida: R-68

Gorse. See in Index Furze

Gortyna (*gôr-tî'nâ*), next to Cnossus largest and most powerful city of ancient Crete, near center of island.

Gosart, or Gossart, Jenni (died 1532), real name of Jan Mabuse, a Flemish painter, first of the "Italianized" Flemings.

Goschen, Sir William Edward (1847-1924), British diplomat; minister to Germany, 1908-14: W-152

Goshawk H-245, 246, 247

Goshen (*gô'shên*), the region in Egypt occupied by the Israelites, w. of modern Suez Canal (Gen. xiv, 10).

Goshen, Ind., city on Elkhart River 23 mi. s.e. of South Bend; pop. 11,375; flower-growing; iron products, furniture, rubber goods; Goshen College (Mennonite): map I-46

Goshenite, a colorless beryl used as a gem-stone.

Goslar, Germany, walled town in Hanover; celebrated millenary 1922; pop. 21,000: H-233

Gos'nold, Bartholomew (died 1607), English navigator and explorer, leading colonist of Jamestown, Va.; died there New England explorations A-145, C-80

Gospels, four books of New Testament giving account of life and teachings of Jesus Christ J-213 Book of Kells B-178

Gos'samer, extremely fine filamentous substance spun by spiders S-256

Gosse (*gôs*), Sir Edmund (1849-

1928), English poet and critic ('Father and Son'; 'History of Modern English Literature').

Gosse, Philip Henry (1810-88), English naturalist ('The Ocean'; 'The Romance of Natural History').

'Gösta Berling's Saga', story by Selma Lagerlöf based on legends and traditions about a romantic character who lived in a provincial part of southern Sweden during the first part of the 19th century.

Göta (*yû'tâ*) Canal, in Sweden S-337 Götaland, a province of Sweden S-336-7

Gotama (*gô'tâ-mâ*), or Gautama, family name of Buddha E-258

Göteborg (*yû'tû-bôr*), also Gothenburg, 2d city, chief port, and important manufacturing center of Sweden, on s.w. coast at mouth of Göta River; ships, furniture, textiles; pop. 245,000: S-337 liquor regulation S-338

"Go, tell the Spartans" P-136

Gotha (*gô'tâ*), Germany, manufacturing town on Leine canal, 80 mi. s.w. of Leipzig; pop. 46,000; formerly joint capital with Coburg of Duchy of Saxe-Coburg-Gotha; Friedenstein Castle: map G-66

Go'tham, a village in Nottinghamshire, England, inhabitants of which are said to have played the fool in order to dissuade King John from settling there and burdening them with expense of royal residence; hence called "Wise Men of Gotham." Also nickname of New York City from alleged pretensions of its people to wisdom; first used by Irving in 'Salmagundi' (1807).

Gothenburg. See in Index Göteborg

Gothic alphabet G-62

German printing G-60

Gothic architecture A-265-70

American revival A-272

arch A-269, picture A-268

buttress A-269

cathedrals C-100, A-267-9, E-328.

See also in Index Cathedrals

decoration A-269

English E-280: Canterbury cathed-

ral C-76-7, picture C-77; Lincoln

cathedral E-280, picture E-281;

Houses of Parliament L-188, pic-

tures L-183, 185, P-77; Westmin-

ster Abbey W-72-3, L-188, pictures

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fan-vaulting A-269

flamboyant style, picture W-139

flying buttresses A-268, pictures

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French A-265-9, E-328: Amiens cat-

hedral, picture A-187; Notre

Dame Cathedral, pictures A-266,

A-267; Reims cathedral R-70-1,

picture C-100

German: Cologne cathedral, picture

C-304; Strasbourg, picture A-137

Gild halls: Cloth Hall at Ypres,

pictures Y-210; merchants' hall in

Freiburg, picture G-87

Italian: Florence cathedral (duomo),

picture F-108; Giotto's tower G-89,

picture G-90; Milan cathedral

I-165, pictures E-329, I-163

modern: Cathedral of St. John the

Divine, picture A-273; Houses of

Parliament, London, pictures

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University hall, picture E-180;

Vassar College library, picture

E-182

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Romanesque compared with A-268

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ture S-56

Spanish: Seville Cathedral S-86

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Gothic furniture I-98-9, F-219

Gothic language G-62

Gothic type B-177

angular Gothic, examples B-177, 179

Gothic wood-carving, picture W-139

Goths G-123-4, E-322-3

ancient home S-336

Visigoths, Alaric's leadership A-99;

kingdom in Spain S-229, G-123

Got'land, or Gottland, largest island in Baltic Sea, e. of Sweden, to which it belongs; 1142 sq. mi.; farming, stock-raising maps N-173, E-326d-e

Goto (*gô-tô*), Count Shimpel (1856-1929), Japanese statesman; studied medicine and entered public life through sanitation achievements; won fame as civil governor of Formosa; president of South Manchuria Railway, held three cabinet posts, last being secretary foreign affairs.

'Götterdämmerung' (*gû-têr-dêm'mêr-ung*), fourth opera in Wagner's series 'Der Ring des Nibelungen' story O-233

Göttingen (*gû'tîng-ên*), Germany, town 60 mi. s. of Hanover; pop. 42,000; noted university, Georgia Augusta, founded by George II, with richest library of modern literature in Germany: map G-66

Gottschalk (*gô't'shûlk*), Louis M. (1829-69), American pianist and composer, born New Orleans, La.; greatest success in playing his own compositions throughout U. S. and Latin America; died at Rio de Janeiro; best known for piano pieces ('The Last Hope'; 'Le Bananier').

Gouache (*gû'wash*), a picture painted with a pigment (also called gouache) made of opaque colors ground in water and mixed with gum arabic.

Gouch'er College, at Baltimore, Md.; women; founded 1885 as Woman's College of Baltimore (opened 1888); changed name 1910; arts and sciences.

Gouda (*gou'dâ*) cheese C-164

Goudge, Elizabeth (born 1900), English novelist, born in Wells, England; grew up in Wells and Ely, cathedral towns which form the background of 'A City of Bells'. Oxford in days of Queen Elizabeth is setting of 'Towers in the Mist'.

Goudy (*gou'di*), Frederic W. (born 1865), type designer and printer, born Bloomington, Ill.; created more than a hundred type faces; author of several books on lettering and type design; lecturer on type design and typography; founded Village Press (name given to his private press wherever he lived); his typographic style has been important in fixing contemporary trends: T-174

Gouges (*gô'zh*), Olympe de (1748-93), a French pioneer of feminism, guillotined for defending Louis XVI treatise on women's rights W-132

Gough (*gôf*), Sir Hubert (born 1870), British general, commanded Fifth Army during German Somme offensive, March 1918; made scapegoat for failure of his superiors to give him adequate support.

Gough, John B. (1817-86), American temperance lecturer, born England; popular for his earnest but amusing addresses.

Gough Island, in Atlantic Ocean A-358

Gouin (*gô-ân*), Sir Lomer (1862-1929), Canadian lawyer and statesman; Liberal leader; premier and

Key—câpe, ât, fâr, fâst, whât, fâll; mē, yēt, fērn, thêre; îce, bît; rōw, wón, fôr, nôt, dō; câre, bût. ryde, fyll, bârn;

- attorney general of Quebec, 1905-20; Canadian minister of justice in King cabinet 1921-24; lieutenant governor of Quebec 1929.
- Goujon (*gō-zhōn'*), Jean (1520?-66?), French Renaissance sculptor and architect, skilful metal worker 'Fountain of the Nymphs' S-58, *picture* S-59
- Goulburn River, in Victoria, Australia, tributary of Murray River; 330 mi. long; navigable in its lower course.
- Gould, George Jay (1864-1923), capitalist, born New York City; eldest son of Jay Gould; controlled many railroads including the Missouri-Pacific and the Wabash.
- Gould, Helen Miller (Mrs. Finley J. Shepard) (born 1868), American heiress and philanthropist, daughter of Jay Gould
- Hall of Fame donated by H-201-2
- Gould, Jay (1836-92), American self-made capitalist, born Roxbury, N. Y.; early associate of Daniel Drew and "Jim" Fisk in manipulating Erie railroad stocks; gained mastery over what became the Gould system of roads; with Fisk tried to corner gold market, causing "Black Friday" panic.
- Gould, Sabine Baring. *See in Index* Baring-Gould
- Gould Foundation. *See in Index* Edwin Gould Foundation
- Gounod (*gō-nō'*), Charles François (1818-93), French composer of sacred and dramatic music
- 'Faust', opera O-230
- 'Romeo and Juliet', opera O-233
- Goupil (*gū-pē'*), René (1607?-42), French missionary, born Anjou, France; lay brother of Society of Jesus; captured by Iroquois on way to Huron mission and killed near what is now Auriesville, N.Y.; canonized 1930.
- Gour (*gour*), or gaur, wild ox of India and s.e. Asia C-102
- Gourami (*gō'rā-mī*), a fish A-235, *color plate* A-233a-b
- Gouraud (*gō-rō'*), Henri Joseph Eugene (born 1867), French general in the 1st World War; high commissioner in Syria and commander in chief in the Levant in 1919; military governor of Paris 1923-37.
- Gourde, monetary unit of Haiti, worth 20 cents in United States money.
- Gourds, plants related to melon and squash G-124
- cups made from, *picture* P-221d
- Gourgues (*gōrgē*), Dominique de (1530?-1593), French soldier and adventurer F-110
- Gourlay, Robert Fleming (1778-1863), Canadian author and agitator, born Fifeshire, Scotland; came to Canada 1817; known for criticism of the poor laws and of the "Family Compact"; banished from Canada until 1842 ('Statistical Account of Upper Canada').
- Gourmont (*gōr-mōn'*), Rémy de (1858-1915), French critic and poet, second only to Anatole France as an authority on contemporary French literature; defender of naturalism of Huysmans and symbolism of Mallarmé.
- Government G-124-6, *Outline* P-294-5. *See also in Index* Democracy; United States Government; and the various branches and functions of governments by name
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- aristocracy G-125
- autocracy G-126, D-45, 47
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- "Government of the people, by the people, for the people," L-142, 144
- Government ownership. *See also in Index* Irrigation and reclamation, *subhead* United States; Lands, public; Municipal ownership; National forests; National parks
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- Austrian railroads A-378
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- Japanese camphor C-41
- Java railroads J-205
- natural resources C-343
- New Zealand N-135
- public utilities P-364-5, C-236
- Rumanian minerals, forests R-175
- socialism S-180-1
- South Africa transportation S-203
- Switzerland S-352
- Thailand T-73b
- United States: natural resources C-343-4; utilities P-364-5, C-236
- Government Printing Office, the official printing and publishing plant of the U.S. government, established 1860 by act of Congress; supplies all printing, publishing, and stationery needs of the Federal government. Office is under supervision of a Congressional committee and is managed by the Public Printer who is appointed by the president with the approval of the Senate. Superintendent of documents has charge of the sale of government publications: *picture* W-25
- Government regulation of industry. *See also in Index* Government ownership; Municipal ownership
- advertising A-24a: postal rules A-24
- agriculture R-146l, A-56b-57, W-84
- aviation A-91-2
- "blue sky" laws S-292
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- railroads A-313-14, I-112, R-151
- reindeer in Alaska A-103, R-71
- rubber, by England R-165
- salmon F-78, A-106
- sweatshop laws S-334
- tobacco T-104
- trusts T-146-8, U-247-8
- water power W-51, U-231
- water supply W-56
- Governor, of states in U. S. S-278
- early powers A-317
- first women elected W-133
- Governor, of steam engine, a device to regulate automatically the flow of steam S-284
- Governor General, in Canada C-62
- Governors Island, fortified island in New York City harbor at junction of Hudson and East rivers; area about 125 acres; called Nooten Island by Dutch colonists; received present name in late 17th century when colonial governors established a summer residence there. Now the site of Fort Jay and headquarters of First Army of the U.S. as well as headquarters of Second Corps Area: *map* N-130
- Gower, John (1325?-1408), English poet, called by Chaucer "moral Gower" and by Lowell "undertaker of the fair medieval legend"; chief work, 'Confessio Amantis', includes many moral stories warning a lover against the vices of that day.
- Gowrie, John Ruthven, 3d Earl of (1577?-1600), Scottish nobleman killed, with his brother Alexander, in apparent attempt to assassinate King James VI of Scotland; some evidence that "Gowrie's Conspiracy" may have been a story contrived to hide the king's fault in a personal quarrel which led to violence.
- Gowrie, William, first Earl of (1541?-84), Scottish nobleman; concerned in murder of Rizzio in 1566; custodian of Mary, Queen of Scots, at Lochleven; captured James VI of Scotland in 1582; executed for treason by order of James.
- Goya (*gō'yā*) y Lucientes, Francisco (1746-1828), Spanish portrait painter, lithographer, and etcher; greatest Spanish artist between Velásquez and Fortuny; his work is bold but unexaggerated and life-like; notable portraits of Charles IV and Queen Maria Louisa, Duchess of Alva, Duke of Wellington: P-21
- etchings E-295
- Goyaz (*gō-yās'*), city in state of Goyaz in cent. Brazil; pop. 30,000; altitude 1600 ft.; agriculture and cattle raising: B-226c, *map* B-226
- Goyaz, state in interior Brazil, chiefly forested highlands; 254,901 sq. mi.; pop. about 750,000; gems, cattle, tobacco; primitive gold mining for centuries.

ü=French u, German ü; gem, gō; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); x=German guttural ch

Goyen, Jan Josephszoon van (1596-1656), Dutch landscape painter, depicts typical landscapes with naturalistic truth unmingled with sentiment; cool tints in the skies and scanty detail in buildings and foliage are characteristic.

Gozo (*ġoḏ'zō*), island of British colony of Malta in Mediterranean 3 mi. n.w. of Malta; 26 sq. mi.; Victoria chief town.

Gozzi (*ġoḏ'sē*), Carlo (1722-1806), Italian dramatist; wrote plays, satirical dramas founded on fairy tales, and tragedies with a comic element; 'Re Turandote' is the best known.

Gozzoli (*ġoḏ'sō-lē*), Benozzo (*bā-nōt'tsō*) (1420-98?), Florentine painter, real name Benozzo di Lese; worked first under Fra Angelico; excelled at richly decorative religious frescoes ('Madonna and Child with Saints'; 'Journey of the Magi to Bethlehem'; frescoes depicting lives of St. Francis and St. Augustine).

Grabau, Mary Antin. *See in Index* Antin, Mary

Graben (*grā'bēn*), street in Vienna, built over medieval moat: V-297, picture V-298

Grabhorn, Edwin and Robert, brothers, contemporary American printers, for many years working in San Francisco; known for skilful use of fine types and careful composition; leaders in group sometimes called California school of printers.

Gracchus, Gaius Sempronius (153-121 B.C.), Roman popular leader, son of Cornelia and brother of Tiberius Gracchus; as tribune of the people 123-121 B.C. carried out his brother's judicial and social reforms: R-134

aids poorer classes P-302

Gracchus, Tiberius Sempronius (163-133 B.C.), Roman tribune in 133 B.C. proposed agrarian laws and other reforms for relief of poor; murdered in riot caused by his attempt to secure reelection as tribune: R-134

Grace, in religion, the enjoyment of God's favor; spiritual gift of God by which man is able to choose the right and find salvation; in Roman Catholic church the state of grace is held to be obtained through the sacraments. The term is also used for a prayer before or after a meal, asking a blessing or returning thanks.

Grace, days of. *See in Index* Days of grace

Graces, in Greek mythology, three daughters of Hera and Zeus: Euphrosyne (joyfulness), Aglaia (brightness), and Thalia (bloom), goddesses of grace and charm Aphrodite and A-227

Botticelli's 'Spring', picture P-16

Gracián (*grā-thē-ān'*), Baltasar (1601-58), Spanish writer and Jesuit; style concise and epigrammatic, but sometimes obscure; best known for philosophical novel 'El Criticón'; in 'El Discreto' describes typical gentleman.

Grackle, purple, a blackbird B-152-3

Gradation, in physiography P-197, 198

Grade cattle C-103-4

Grady, Henry Woodfin (1850-89), journalist and orator, born Athens, Ga.; in 1879 he bought share in *Atlanta Constitution*, and as editor did much to restore friendly relations between the North and the South; spoke widely on "The New South" and similar subjects monument in Atlanta A-358

Grææ (*grē'ē*), in Greek mythology, "the gray ones," three sisters, Dino, Enyo, and Phephredas, daughters of Ceto and Phorcys, gray-haired from birth

Perseus aided by P-127

Græco-Roman wrestling W-183

Graetz (*grēts*), Heinrich (1817-91), German-Jewish historian, born province of Posen; professor University of Breslau 20 years; most noted for his scholarly history of the Jews, which has been translated into several languages.

Graf, or Graff, Urs (1485?-1527), Swiss engraver and goldsmith E-295

Graffenreid (*gräf'en-rīt*), Christopher de, Baron, early settler in North Carolina N-159

Grafty, Charles (1862-1929), American sculptor, born Philadelphia, Pa.; noted for symbolical figures and groups and portrait busts; one of foremost American portrait sculptors of day; instructor Pennsylvania Academy of Fine Arts and Boston Museum of Fine Arts.

'Graf Spee, Admiral', German battleship W-178f

Grafting, of plants fruit trees F-211, pictures F-213 grape-vines G-135, 136

Grafton, N. D., trade center in n.e. on Park River, 15 mi. w. of Minnesota border; pop. 4070; seat of Walsh County; grain and livestock shipping: map N-162

'Graf Zeppelin', German dirigible B-31

Graham, George Perry (born 1859), Canadian journalist and statesman; Liberal leader; in Ontario legislature 1898-1907; later in House of Commons; minister of railways and canals 1907-11, 1923-26.

Graham, James, Viscount Dundee. *See in Index* Claverhouse

Graham, Martha, dancer and choreographer, leading exponent of the modern dance in U.S.; born Pittsburgh, Pa.; began study with Ruth St. Denis 1916; New York debut 1926; instructor at Bennington College, Vermont, and at the School of American Ballet, New York City; choreographies include 'Frontier', 'American Document'.

Graham, Robert Bontine Cunningham. *See in Index* Cunningham Graham

Graham, Sylvester (1794-1851), American reformer, born Suffield, Conn., advocate of temperance, vegetarianism, and whole wheat (graham) bread.

Graham, Thomas (1805-69), Scottish chemist, originated term "colloids," and discovered "Graham's law" that diffusion rate of gases is inversely as square root of their densities.

Grahame, Kenneth (1859-1932), Scottish writer, born Edinburgh; educated in England; author of delicate and poetic, sometimes fantastic, books ('The Golden Age'; 'The Wind in the Willows').

Graham flour F-119

bread B-229: food value B-231-2

Graham Land, peninsula in Antarctic continent; discovered by John Biscoe in 1831: A-216, 217, map A-215

discoveries of Wilkins P-286

Grahamstown, Union of South Africa, city in Cape of Good Hope, 80 mi. n.e. of Port Elizabeth; pop. 20,000 (including 8000 Europeans); ships ostrich feathers; Rhodes University

College, St. Andrews College: map A-42a

Grail, Holy, cup used by Christ at Last Supper G-1

Arthurian legends G-1, R-160, A-316 pictures A-315, 316

Grain, cereal. *See in Index* Cereal crops

Grain, unit of measure W-67

Grain, grinding. *See in Index* Flour and flour milling

Grain alcohol, or ethyl alcohol A-112

chemical composition C-176b

fuel for combustion engines F-215

Grain elevator G-126

Buenos Aires, picture A-280c

Minneapolis M-190, picture F-117

Port Arthur, picture C-52

Grain exchange B-160-1, E-151-2

"future" trading regulated U-230

Grainger, Percy Aldridge (born 1882), British-American pianist and composer, born Melbourne, Australia; studied with mother, later with Busoni in Berlin; friend of Grieg, who influenced him greatly; settled in U. S. 1915; served as bandsman and instructor in music in U. S. army in 1st World War and was afterwards naturalized; compositions based chiefly on folk music ('Molly on the Shore'; 'Shepherd's Hey'; 'Country Gardens').

Grains of paradise, or Meleguetta pepper, a spice S-249

Grain weevil W-65

Gram, another name for chick-pea P-90

Gram, metric unit of weight M-130

Gram-atomic weight, in chemistry C-170

Gramineæ (*grā-mīn'ē-ē*). *See in Index* Grass family

Grammar G-126-9

adjective A-21, G-128

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conversation aided by C-347c

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pronoun P-351-2, G-128

punctuation P-366, 368, G-127

rhetoric distinguished R-92

sentence S-78-9, G-127-8

verb V-281-2, G-128

Gramophone, or phonograph P-174.

See also in Index Phonograph

Grampian Mountains, or Grampian Hills, principal mountain mass in Scotland, really a series of spurs; 150 mi. long; rugged on n. side but good pasture land on s.: S-44, map E-270a

Ben Nevis, picture S-45

Grampus, or killer whale, a species of dolphin (*Orcinus orca*), boldly marked in black and white W-77, 78, picture W-79

Granada (*grā-nū'dā*), Nicaragua, one of chief cities; pop. 21,000; university: N-141

Granada, a former Moorish kingdom in southern Spain; about 11,000 sq. mi.; divided into three modern provinces of which Granada (4928 sq. mi.; pop. 650,000) is one: map S-226

flag of Middle Ages F-97, color plate F-88

history M-255, picture S-227

Granada, Spain, once capital of Moorish kingdom, now capital of province of the same name, 120 mi. n.e. of Gibraltar; pop. 120,000; cathedral; university: S-228, map S-226, picture S-225

Alhambra A-127, picture S-233

Granados y Campina (*grā-nū'dōs ē kām-pe'nā*), Enrique (1868-1916),

Spanish composer best known for Spanish dances and opera 'Goyescas'; died as passenger on *Sussex* torpedoed during 1st World War.

Granby, Quebec, town on Yamaska River about 55 mi. s.e. of Montreal; pop. 10,587, chiefly French; rubber goods, tobacco, lumber, furniture, foundry products.

Gran Chaco. *See in Index* Chaco

Gran Chimú (*grän ché-mq'*), or Chanchan, capital city of the Yuncas, *picture* A-253

Grand Alliance, league of European powers E-324

Grand Alliance, War of, or War of the League of Augsburg American phase K-23

Grand Army of the Republic, a society of Civil War veterans organized at Decatur, Ill. in 1866 P-89

Grand Bank. *See in Index* Newfoundland Banks

Grand Bassam (*bäs-säm'*), French West Africa, port of Ivory Coast colony; pop. 7000; ships rubber, cotton, coconuts.

Grand Canal, China C-67, C-221c, *map* C-212

Grand Canal, Venice V-277, *picture* B-251

postal service on, *picture* P-316
Turner's painting, *picture* P-20

Grand Canary, Spanish Gran Canaria, one of Canary Islands, 74 mi. from coast of northwest Africa; 644 sq. mi.; pop. 163,000; healthful climate; large tourist trade; fishing and vineyards: *map* A-42a

Grand Canyon, of Colorado River, in n. Arizona G-129-31, *maps* A-289, *pictures* G-129, 130, N-16
discovered by Coronado C-370
national monument N-22a
national park N-22a

Grand Canyon of the Waimea, Hawaiian Islands H-243

Grand Central Station, N.Y.C. R-40, 44
Grand Coulee Dam, in state of Washington D-7, 8, C-315-16, *picture* D-6a, *table* D-357

Grande Chartreuse (*gränd shär-trüz'*), La, original mother-house of Carthusian monks M-233

Grantee, title of honor borne by highest class of Spanish nobility; formerly implied certain important privileges, but later became merely a distinction of rank.

Grand Falls, of the Hamilton River, Labrador L-46

Grandfather clause, provision formerly included in constitution of several southern states which excuses from other suffrage tests those who have served in any war and their descendants and those who were voters before Jan. 1, 1867, and their descendants; adopted as means of restricting suffrage to white voters; declared unconstitutional by U. S. Supreme Court 1915.

Grandfather's clock W-37, *picture* W-36

Grand fir. *See in Index* Giant fir

Grand Forks, N.D., 2d city in state, on e. boundary on Red River; pop. 20,228; distributing point for wheat and live stock; flour, packing-house products, beet sugar, brick: *map* N-162
state university, *picture* N-163

Grand Haven, Mich., port and summer resort on Lake Michigan at mouth of Grand River 25 mi. w. of Grand Rapids; pop. 8799; fishing, fruit, and celery interests; various manufactures; government weather station; state park: *map* M-153

Grandi (*grän'dé*), Dino (born 1895),

Italian statesman; identified with Fascist party from its beginning and played conspicuous part in Fascist march on Rome; minister of foreign affairs, ambassador to Great Britain, and later minister of justice.

Grand Island, Neb., manufacturing and commercial city 85 mi. w. of Lincoln in rich agricultural and stock-raising district; industrial center; large horse and mule market; State Soldiers' and Sailors' Home; pop. 19,130: *map* N-57

Grandison, Sir Charles, hero of Richardson's novel of that name; self-conscious prig, designed to represent ideal English gentleman: N-182

Grand Junction, Colo., agricultural and mining center at junction of Colorado and Gunnison rivers, near Utah border; pop. 12,479; Mesa County Junior College: *map* C-310

Grand jury J-230
Henry II establishes H-275

Grand Lake, largest lake of Newfoundland; length 56 mi.; 192 sq. mi.

Grand Lama, or Dalai Lama, ruler of Tibet T-90

Grand' Mère (*grän mēr'*), Quebec, lumber-manufacturing town on St. Maurice River, about 25 mi. n. of Three Rivers; pop. 6461; pulp, paper, furniture, rubber goods.

"Grand Monarch, The," Louis XIV of France L-201, *picture* L-202

Grand Mufti, chief of Mohammedan theologians. *See also in Index* Mufti

"Grand Old Man," Gladstone G-98

Grand Old Party, name given to Republican Party by campaigners in 1880; since shortened to G. O. P.

Grand opera. *See in Index* Opera

Grand piano P-211

Grand Portage, nine-mile overland carrying route in n.e. Minnesota between Lake Superior and Pigeon River; famous in American fur trade and exploration history; trading post maintained here by North-West Company.

Grand Pré (*grän prā*), Nova Scotia, historic village about 45 mi. n.w. of Halifax, near Minas Basin, in farming and fruit-growing district; pop. 256; famous as scene of Longfellow's 'Evangeline'; N-180
statue of Evangeline, *picture* C-59

Grand Rapids, Mich., "furniture capital of United States"; pop. 164,292: G-131, *map* M-153

Grand Remonstrance, protest against misgovernment presented to Charles I (1641) by English House of Commons; the king's impeachment of and attempt to arrest the 5 leaders responsible for the Remonstrance were causes of the English Civil War.

Grand Rhone River R-100

Grand River, Labrador. *See in Index* Hamilton River

Grand River, S. D., rises in n.w.; flows e. to Missouri River, *map* S-218

Grand Teton National Park, Wyo. N-22a

Grand Trunk Pacific Railroad C-55

"Grand Union," or Cambridge, Flag F-98, *color plate* F-90

Grand white fir. *See in Index* Giant fir

Grange, Harold E. (Red) (born 1904), American football player, born Wheaton, Ill.; University of Illinois halfback, 1923-25; scored many touchdowns on long runs; entered professional football 1926 ('Zupke of Illinois'): F-151d

Grange, National. *See in Index* National Grange

Grania (*grā'nī-ā*), or Grainne (*grān*), in Celtic mythology the Helen of the Fenian cycle of old Irish tales, beautiful young betrothed of the old Finn; deserts him for Dermot, but weds him when Dermot dies.

Granicus (*grā-nī'kūs*), ancient name of small river in n.w. Asia Minor where Alexander the Great won first victory over Persians, 334 B.C.

Granite G-131
commercial types Q-2
quarrying Q-1-3

United States quarries G-131: Fall River, Mass. F-7; New Hampshire, *chart* N-86, *picture* N-87; Vermont V-287, *picture* V-286
Windsor green V-287

Granite City, Ill., manufacturing city near Mississippi River, just n. of St. Louis, Mo.; pop. 22,974; iron and steel, coke, chemicals, graniteware, corn products.

Granite Hills, Vt. V-286

Granite Peak, a summit of Rocky Mts., highest point in Montana (12,850 ft.).

Granite State, popular name for New Hampshire.

Graniteware E-266

Granny knot, or lubber's knot K-34

Gran Quivira (*grän kē-vē'rā*), national monument in New Mexico N-22a, N-99

Granson, battle of (1476) C-153

Grant, Duncan (born 1885), British painter; a modernist strongly influenced by Cézanne ('The Lemon Gatherers'; 'Tight-rope Walker').

Grant, Frederick Dent (1850-1912), American general; accompanied father, Gen. U. S. Grant, in many Civil War campaigns; graduated West Point 1871 but resigned from army 1881; colonel of volunteers 1898, served in Cuba and Philippines, successively promoted until major-general in regular army.

Grant, George Monro (1835-1902), Canadian clergyman and educator, known for his eloquence on political platform scarcely less than in pulpit; for 25 years principal of Queen's University, which he made one of leading Canadian institutions.

Grant, Julia Dent (1826-1902), wife of President Grant W-92, G-132

Grant, Robert (1852-1940), American judge and author, born Boston ('Unleavened Bread'; 'The Chippendales'; 'Fourscore—An Autobiography').

Grant, Ulysses S. (1822-85), 18th president of U. S. G-132-3
administrations (1869-77) G-133
Alabama claims arbitrated A-99
arbitration, Gt. Brit.-Portugal A-246

Boston Fire B-203
carpetbag rule in the South C-257

Centennial Exposition G-133

Chicago Fire C-193

Custer massacre C-415, I-68

15th Amendment U-210-11, G-118

first national park N-15

Hayes-Tilden election H-250-1

panic of 1873 G-133

Prohibition party organized P-350
resumption of specie payments provided G-133, M-220b

Union Pacific completed R-37, *picture* U-246

Civil War service G-132-3, C-254-5
Chattanooga C-157

Richmond campaigns C-255

Sheridan aids S-114

Sherman and S-115-16

Shiloh S-116
Vicksburg V-293, G-132
last years G-133
tomb G-133, picture N-126
wife W-92
Grant Land, Canada, n.w. part of
Ellesmere Island, n.w. of Greenland
A-277, map N-150b
Grant Park, Chicago C-191
Granulation, the art of soldering
grains of gold into delicate pat-
terns; brought to height by ancient
Etruscan goldsmiths 700 B.C.
Granville, John Carteret, Earl (1690-
1763), English statesman; popular
with the Hanovers, but opponent
of Walpole; very successful as am-
bassador to Sweden and as lord
lieutenant of Ireland; after down-
fall of Walpole was for two years in
control of foreign affairs; brilliant
diplomat and orator.
Granville-Barker, Harley Granville
(born 1877), English playwright,
producer, and writer on theater;
thoughtful, skilful, unromantic
dramas ('The Voysey Inheritance';
'The Madras House'; 'Waste';
'His Majesty'); began career as
actor at 14; with his wife, Helen,
translated from Spanish plays of
G. Martinez Sierra and Brothers
Quintero.
Grao (*grā'ō*), El, harbor of Valencia,
Spain V-269
Grape aphid, or phylloxera, an insect
parasite G-135, G-163
Grape family, or Vitaceae (*vi-tā'sē-ē*),
a family of plants and shrubs in-
cluding the grapes, Virginia creeper,
Boston ivy, marine ivy, and ampe-
loopsis.
Grapefruit, or pomelo, a citrus fruit
G-133-4, picture F-112
Florida F-111
vitamin C, rich in V-311a
Grapes G-135-6
currants C-414
diseases and pests: mildew M-170;
moths B-286; phylloxera G-135
Europe: France G-135, picture
F-178; Portugal P-313; Spain
S-228
food value G-136
improvement of varieties A-53, G-135
propagation methods G-136
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seeds 3000 years old G-136
tartaric acid from T-14
United States G-136: California
G-135-6, C-29; Ohio O-213
uses G-136
value compared with orange O-238
Grape-shot, an old type of artillery
projectile A-322
Grape sugar, or dextrose, the com-
monest of the monosaccharide
sugars, same as glucose C-176b,
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Graph, statistical, a picture or dia-
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lated numerical facts G-136a-j
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graphs G-136d-e; pictograph
G-136a-c; pie chart, or circle
graph G-136e-f
making simple graphs G-136j
plotting curves L-80-1
Graphite (*grā'it*), or plumbago, a
soft, black form of crystalline car-
bon G-136
allotropic form of carbon, diagram
C-170
electroplating E-226

electrotyping E-243
"lead" in pencils P-106-8
Graphology (from the Greek, meaning
the study of writing), the art of
judging a person's characteristics
by an examination of his hand-
writing.
Graphophone, another name for pho-
nograph P-174. See also in Index
Phonograph
Grapple dredges, type of excavating
machine D-104-5
Grapple plant, a perennial plant
(*Harpagophytum procumbens*) of
the pedaliaceae family, native to
South Africa. Plant is covered with
slime-secreting glands and bears
seed capsules covered with stiff
spines.
Gras'mere, England, a picturesque
village in Westmorland, near lake
of same name; famous as a haven
for poets and authors; home of
Wordsworth.
Grasse (*grās*), François J. P., Comte
de (1722-88), French admiral, com-
manded French fleet in operations
before Yorktown in American Revolu-
tion R-91, N-56d-e
Grasse, France, 18 mi. w. of Nice;
pop. 20,000; winter resort; marble
quarries; makes oil and conserves
perfume industry P-124
Grasser (*grās'ēr*), Erasmus (1450?-
after 1526), German wood engraver,
architect and sculptor; worked in
many parts of Germany
statue of dancer, picture W-138
Grasses G-136j-37
distinguished from sedges S-73
flood prevention F-106d
hay-yielding types H-249
leaf veins, picture L-89
rainfall affects growth C-270b
used for lawns G-9
Grass family, or Gramineae (*grā-
min'ē-ē*), a family of plants, dis-
tributed over the world, including
the cereals, sugarcane, sorghum,
bamboos, forage, hay, and pasture
grasses, lawn and ornamental
grasses; most valuable to man of
all the plants G-136j-137
Grasshopper G-137-40
classified G-140
distinguished from locust G-140,
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white attracts N-32
"Grasshopper constitution" N-60
Grasshopper mouse M-293
Grasshopper plane, picture A-80
Grasshopper sparrow S-238
Grassi (*grās'sē*), Battista (1854-1925),
an Italian zoölogist, studied espe-
cially the mosquito and malaria, and
the life and habits of termites and
eels.
Grass Lake, Ill., near Illinois-Wiscon-
sin line; noted for lotus: L-199
Grass rugs R-174
Grass snake, one of the garter snakes,
so called because it lives in the
grass
eggs, picture E-193
Grasswort, starry. See in Index
Cerastium
Gratiano (*grā-shi-ā'nō*), character in
Shakespeare's 'Merchant of Venice'
M-119
Grattan (*grāt'ān*), Henry (1746-
1820), Irish patriot, orator, and
statesman; opposed parliamentary
union of Ireland with Great Britain,

but accepted accomplished fact; in
British Parliament 1805 till death;
strove for Catholic emancipation;
conspicuous for probity of his char-
acter no less than for his ability.
Grätz (*grēts*), Germany. See in Index
Graz
Gravel S-191
Gravelines (*grāv-lēn'*), France, forti-
fied seaport on Aa River, 10 mi.
s.w. of Dunkirk; fisheries, shipping,
shipbuilding; here Spanish troops
in 1558 under Egmont defeated
French under Marshal Thermes.
Gravelotte (*grāv-lōt'*), France, village
7 mi. w. of Metz; defeat (Aug. 18,
1870) of French under Bazaine by
Prussians under Crown Prince
Frederick (also called battle of Re-
zonville) led to siege of Metz
cavalry charge, picture F-180
Graver, or burin, an engraving tool
E-294
Graves, Alfred Perceval (1846-1931),
Irish poet, born Dublin; took part
in Irish musical and literary renaiss-
sance; popularized folk melodies;
best known for ballad 'Father
O'Flynn'.
Graves, Robert R. (born 1895), Eng-
lish poet, son of Alfred Perceval
Graves ('Fairies and Fusiliers');
also wrote criticism and autobiog-
raphy containing memories of 1st
World War ('Good-Bye to All
That'; 'I, Claudius'; 'Claudius the
Great').
Graves, Thomas, Lord (1725?-1802),
English naval officer, rear admiral
of British fleet in American Revolu-
tion; made admiral 1794 and in
same year took part in Lord Rich-
ard Howe's victory over the French
off Ushant: N-56e
Gravesend (*grāv'sēnd*), England,
market town and river port on
Thames River 22 mi. s.e. of Lon-
don; pop. 35,000; favorite resort
for Londoners.
Gravimetric analysis, in chemistry
C-174
Gravitation G-140-3
acceleration imparted by P-190
comets controlled by C-321
Einstein's explanation B-213
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Newton discovers law N-110
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draws material particles of the uni-
verse toward each other G-140-3.
See also in Index Gravitation
Gravity, center of G-143, P-192
Gravity, specific G-143, P-189. See
also in Index Specific gravity
Gravity concentration, gold milling
process G-112
Gravity dam D-6b
Gravity yard, or hump, railroad R-44
Gray, Asa (1810-88), American bot-
anist, born Paris, N. Y.; cooperated
with Darwin; professor of natural
history, Harvard University; pro-
lific writer on botany and allied
subjects; his manual of botany
much used by students.
Gray, Elisha (1835-1901), American

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dē; cūre, būt, rŷde, fŷll, būrn;

electrician; perfected various telegraphic devices; invented telautograph
 telephone B-93, T-34

Gray, Elizabeth Janet (born 1902), author of children's books; born Pennsylvania; stories have historical settings and show influence of her own background ('Young Walter Scott'; 'Meggy McIntosh'; 'Penn'; 'Jane Hope'; 'Beppy Marlowe of Charles Town').

Gray, George (1840-1925), American jurist and legislator, born New Castle, Del.; U. S. senator (Democratic) 1885-99; staunch supporter of President Cleveland; U. S. Circuit Court Judge, 1899-1914; served with distinction on several international commissions.

Gray, Hawthorne C. (1889-1927), American army officer (captain) and aeronaut
 balloon ascensions B-22

Gray, Robert (1755-1806), American navigator, born near Tiverton, R. I.; naval officer during Revolution; master of *Columbia*, first ship to carry American flag around world; sent out by Boston merchants to trade for furs with Indians on Pacific Coast
Columbia River named by C-315

Gray, Stephen (1696-1736), English electrician; discovered electric properties of many substances: E-231

Gray, Thomas (1716-71), English poet, rebelled against classicism; great student and possessed vast knowledge of classical authors, painting, architecture, and botany; his greatest poem, 'Elegy in a Country Churchyard', made him one of the immortals of English literature.

Gray, a color C-308b, d
 color intensity lowered by, color chart C-308c

Gray birch, or white birch B-119

Gray-Y clubs, for boys Y-208

Gray duck. *See in Index* Gadwall

Gray fir. *See in Index* Western hemlock

Gray fox F-165-6
 scientific name F-166

Gray Friars. *See in Index* Franciscans

"Gray-hair vitamin" V-311a

Gray-headed coneflower. *See in Index* Lepachys

Graylag, a wild goose G-120

Grayling, a fish allied to the trouts T-145

Gray matter, in the brain B-220, picture B-222

Gray seal, animal S-70, picture S-69

Grays Harbor, an inlet of the Pacific, indenting w. coast of Washington for a distance of 15 mi.: map W-29

Grayson, David. *See in Index* Baker, Ray Stannard

Gray squirrel S-266, picture S-265

Gray wolf, or timber wolf W-128, 129
 enemy of bison B-150

Gratz (gräts), or Gratz, city in Ostmark, Germany, 140 mi. s.w. of Vienna; pop. 155,000; iron and steel; university and technical schools; medieval buildings: maps E-326d, B-18

Grazing land, or pasture land G-137, D-113c

Grazing Service, in U. S. government U-230

Greaser, nickname for Mexican N-143

Greasewood, a spiny shrub (*Sarcobatus vermiculatis*) of the goosefoot family with fleshy leaves; com-

mon in Rocky Mt. region; grows in alkaline and saline soils; used as indicator of salty soil; farmers avoid settlement where greasewood is abundant.

Great American Desert U-182, 186, F-14
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 settlement F-15, C-108

Great ant-eater A-217-18

Great auk, extinct bird A-364, B-145b, picture A-365

Great Australian Bight A-368, map A-372a

Great Barrier Reef, off n.e. coast of Australia, longest coral reef in world (1200 mi.) C-364, map A-372a, picture C-363

Great Basin, region in w. U. S., about 200,000 sq. mi. between Sierra Nevada and Wasatch Mts. U-182

Nevada N-76
 rainfall U-191
 Utah U-264

Great Bear, or Ursa Major, a constellation containing the Big Dipper, charts S-275a, c, d, f, g
 Big Dipper, finding your way by, chart A-341
 Greek legend C-347

FACTS ABOUT THE GREAT LAKES

LAKE	AREA SQ. MI.	LENGTH MILES	BREADTH MILES	COASTLINE MILES	MAXIMUM DEPTH, FEET
Superior	31,820	350	160	2,100	1,290
Huron	23,010	206	183	2,300	750
Michigan	22,400	307	118	1,300	923
Erie	9,940	241	57	800	210
Ontario	7,540	193	53	1,100	774

Great Bear Lake, in n.w. Canada; 11,500 sq. mi.: M-12, map C-50b
 radium deposits in region of R-35

Great Belt, Denmark, strait separating islands of Fünen and Zealand, map D-53

Great Bend, Kan., town on Arkansas River, 92 mi. n. w. of Wichita; pop. 9044; oil wells near by; wheat shipping center: map K-4

Great Bible B-103

Great black-backed gull, picture G-187

Great blue heron S-296-7, pictures S-296, color plate B-134

Great Britain, island separated from w. Europe by English Channel; 88,210 sq. mi.; pop. 44,790,000; comprises England, Scotland, Wales: G-144-6, maps E-279, E-326c, d, f, Outline G-144-6. *See also in Index* British Empire; England; England, history of; Scotland; Wales

Great Charter M-33. *See also in Index* Magna Carta

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Great Commoner, Wm. Pitt, Earl of Chatham C-156

Great Council, in England P-77

Great Dakota Boom S-220

Great Dane, a large dog D-82, 79

'Great Didactic', book on education by Comenius E-179

Great Dismal Swamp. *See in Index* Dismal Swamp

Great Divide. *See in Index* Continental Divide

Great Dividing Range, Australia A-367, 368, maps A-372a

Great Dog, or Canis Major, a constellation C-347, charts S-275, 275f, h

'Great Eastern', ship, picture S-118
 lays cable C-9, picture C-5

Great Egg River, in s. New Jersey, flows s.e. about 60 mi. to Atlantic Ocean, map N-90

Great Elector. *See* Frederick William

Greater Antilles, western islands of West Indies W-72, map W-72a-b

Greater East Asia, Japanese name for area of Far East which Japan undertook to dominate P-10, J-192

Greater London L-190

Greater New York N-134

Greater weever, a fish F-72

Greatest common divisor A-286

'Great Expectations', novel by Dickens; in childhood Pip (Philip Pirrip), the hero, befriended an escaped convict who later became rich and provided for Pip to be educated as a "gentleman of great expectations."

Great Falls, Mont., manufacturing and shipping center on Missouri River 70 mi. n.e. of Helena, in farming stock-grazing, and mining region; pop. 29,928; copper and zinc refining; water power; airport; College of Education: map M-243

Great Falls of the Missouri M-211
 Lewis and Clark at L-99

Great Falls of the Potomac P-326

Great gray kangaroo K-1-2

Great gray slug, a land snail S-167

Great Grimsby. *See in Index* Grimsby

Greatheart, in Bunyan's 'Pilgrim's Progress', guide of Christiana and her children to the Celestial City.

Great Ice Barrier, or Ross Ice Barrier, also called Ross Shelf Ice, in Antarctic region A-214, P-283, map A-215, picture A-217

Great Interregnum. *See in Index* Interregnum, Great

Great Island, site of Cobh (Queens-town), Ireland C-290

Great jury J-230

Great Khingan Mountains. *See in Index* Khingan

Great Lakes, the five lakes (Superior, Michigan, Huron, Erie, and Ontario) lying on the borders of Canada and the U. S.; total area nearly 95,000 sq. mi.: G-146-150a, maps G-146a, 147, U-188c, pictograph G-149, table U-190. *See also in Index* individual lakes by name and table on this page

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Great Lakes Exposition, celebration at Cleveland, Ohio, 1936-37, to commemorate Cleveland's centenary.

Great Lakes-St. Lawrence Waterway R-111

Great Lakes trout T-145

Great Meadows, Pa., site 50 mi. s.e. from Fort Duquesne (now Pittsburgh) where Washington fought first battle (1754), defeating French.

Great Miami River. *See in Index* Miami River

- Great Mogul', a famous diamond D-62, picture D-63
- Great National Pike. *See in Index* Cumberland Road
- Great Nefud Desert, Arabia A-237, map A-242
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- Great organ O-250
- Great Pacificator, Henry Clay C-261
- Great panda, or short-tailed panda Z-222
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- Great Plains, region in central U. S. U-183, 191, maps U-200, N-150
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- Great Powers. *See in Index* Powers, Great
- Great Premier, diamond, picture D-63
- Great primer type T-172
- Great Pyramid P-371-2, E-204, C-16-17, pictures P-371, 372, E-196, C-18
- Great Rebellion, in England (1642-49). *See in Index* Civil War (England)
- Great Rift Valley, in Africa A-38, E-138
- Great Russia, historic division of Russian empire R-178
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- Great St. Bernard Pass, famous Alpine pass (8100 ft.) connecting Rhone Valley with Aosta, Italy monastery at A-136
- Great Salt Lake, in n.w. Utah; area, 2,000 sq. mi.: G-150a, map U-264
- discovery U-266
- Lucin cutoff, picture U-265
- Great Salt Lake Desert U-264, U-182
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- Great Sandy Desert, Western Australia, maps A-372a, b
- Great Schism (sizm)
- East, final division between Roman and Greek Catholic churches (1054) C-232
- West, division in Roman Catholic church (1378-1417) between two factions, each of which supported its own pope U-261, H-363
- Great Seal, of the United States custodian U-222
- Great Serpent Mound, Ohio M-291
- Great Slave Lake, in n.w. Canada; 11,200 sq. mi.: M-12, map C-50b
- Great Smoky Mountains, a range of the Appalachians on border of N. C. and Tenn. A-230, maps T-46, N-156
- Great Smoky Mountains National Park, N. C., Tenn. G-150b-51, N-15, 22a
- Great Southern Ocean. *See in Index* Antarctic Ocean
- Great Stone Face, rock formation in N. H. N-85
- Great Systems of the Universe, book by Galileo G-2
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- Great Trek S-200
- Great Valley, of California C-25, 28
- Great Valley of the Appalachians, or Appalachian Valley, A-230
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- Great Victoria Desert, Western Australia, map A-372a
- Great Wall of China C-221h, maps A-332b, C-212, picture C-209
- Great Wall of Peru S-206c, picture S-205d
- 'Great Western', early steamship S-120
- Great Whale River, in w. Quebec; flows 365 mi. w. to Hudson Bay; map C-50c
- Great white heron S-297, picture N-33
- Great White Way, Broadway, street in New York City E-238, picture N-128
- Great willow-herb. *See in Index* Fireweed
- Great Yarmouth, port and watering place on e. coast of England, 121 mi. n.e. of London; pop. 57,000; herring fisheries (Yarmouth bloaters).
- Greaves, Captain, 17th-century West Indian pirate, born in Barbadoes of English prisoner slaves; renowned for humane treatment of victims; ended career as plantation owner and philanthropist.
- Greaves, armor for the leg below the knee A-304, picture A-305
- Grebes, diving birds G-151
- foot, picture B-129
- pie-billed, color plate B-133; nest, picture B-127
- Grechaninoff. *See in Index* Gretchaninof
- Greco, El (ēl grā'kō) ("The Greek"), name given to Domenico Theotocopuli (1542?-1614), Cretan-Spanish painter, born Crete; forerunner of so-called Modernists; his line and mass arrangement suggests abstract design; figures generally elongated or otherwise distorted; although his predominant color is often grayish and seemingly lifeless he attained high dramatic effects by a skilful use of light and by areas of rich and glowing color; vision, intense emotion, and sincerity revealed in his works; in his later years religious mysticism was a dominant force in his art ('The Burial of the Count Orgaz'; 'The Disrobing of Christ'): P-18
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- Greece, modern, kingdom in s.e. Europe occupying s. part of Balkan Peninsula; more than 50,000 sq. mi.; pop. 6,205,000; cap. Athens: G-153-4, 162-4, maps B-18, E-326e, f, Outline B-21
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 Greeley, Horace (1811-72), American journalist and politician G-174-5
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 Greeley, Colo., trade center of irrigated region, on Cache la Poudre River, 50 mi. n.e. of Denver; pop. 15,995; flour, canned goods, beet sugar; settled in 1870 by "Greeley Colony," group of New Englanders; named for Horace Greeley; state teachers college: *map* C-310
 Greely, Adolphus Washington (1844-1935), American soldier and explorer, born Newburyport, Mass.; served in Civil War; built cable and telegraph lines in Cuba, China, Alaska, Puerto Rico, Philippines
 Arctic expedition P-280
 Green, Anna Katharine (Mrs. Charles Rohlf) (1846-1935), American novelist; wrote detective stories showing good plot and knowledge of criminal law ('Leavenworth Case'; 'Mystery of the Hasty Arrow'; 'The Hand and the Ring').
 Green, Hetty (1835-1916), American financier, born New Bedford, Mass.; noted for shrewdness and parsimoniousness; believed to be richest woman of her day in U. S.

Green, John Richard (1837-83), English historian; brilliant picture of social progress; in his 'History of the English People', gave results of study of years in graphic, popular style
 quoted on Washington W-22
 Green, Julian (born 1900), American novelist, born Paris, France, of American parents; writes in French; works somber in theme; probes deeply into mental problems ('Avarice House'; 'The Closed Garden'; 'The Dark Journey').
 Green, Paul Eliot (born 1894), American playwright, born Lillington, N. C.; taught at University of North Carolina; plays deal with lowly southerners, particularly Negroes ('In Abraham's Bosom', Pulitzer prize; 'The Field God'; 'The House of Connelly'; 'Johnny Johnson'; 'The Lost Colony').
 Green, Thomas Hill (1836-82), English philosopher; chief English representative of Neo-Hegelian school of philosophy; maintained knowledge to be reproduction of eternal mind in human personality; though never popular, theory influenced political and moral philosophy ('Prolegomena to Ethics'; 'Lectures on the Principles of Political Obligation').
 Green, William (born 1873), American labor leader, born Coshocton, Ohio; elected president American Federation of Labor, 1924.
 Green, a color, *chart* C-308c
 eye reaction C-308j
 fireworks A-128
 how perceived L-129
 mixtures C-308b, f-i
 paint P-32
 place in spectrum, *picture* C-308a
 plants, greenness of P-237-8, B-112
 secondary color, *color chart* C-308b, h
 wave-length of light S-242
 Green, in golf G-116
 Green Amazon parrot, *color plate* P-83-4
 Green ash A-323
 Greenaway, Kate (1846-1901), English artist, famous for her quaint and whimsical illustrations for children's books; also wrote verses and sketches for own books ('Under the Window'; 'The Birthday Book'; 'Mother Goose'; 'Little Ann'; 'Kate Greenaway's Almanacs')
 picture-books L-108
 Greenback Movement, in U. S. political history, the movement represented by the Greenback party and the Greenback-Labor party: H-252
 Greenbacks, U. S. notes, so called because back was printed in green M-220b, 221, H-252
 approved by Supreme Court U-212
 Green Bay, an arm of Lake Michigan, 120 mi. long, navigable for largest lake steamers, *map* M-153
 La Salle L-66
 Marquette M-67
 Nicolet W-122
 Green Bay, Wis., port at mouth of Fox River and at head of Green Bay, 108 mi. n. of Milwaukee; pop. 46,235; large trade in coal, lumber, fish, cheese, and grain; makes lumber, machinery, household furnishings, canned goods, paper, flour: W-126, 125, *map* W-124
 Green bee, *color plate* W-32a-b
 Green-bodied damselfly D-90
 Greenbrier, another name for smilax. *See in Index* Smilax
 Greencastle, Ind., city 40 mi. w. of Indianapolis; pop. 4872; D. Pauw University; lumber products.

ü=French u, German ü; gem, go; thin, then; ù=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

cement, zinc products: *map* I-46
 Greene, Nathanael (1742-86), American Revolutionary general G-175, R-91
 quoted B-272
 Greene, Robert (1560?-92), English dramatist and poet, remembered for a few charming lyrics and a derisive reference to Shakespeare in his 'Groatworth of Wit Bought with a Million of Repentance': S-95
 Green-ebony, a tree. *See* Jacaranda
 Greenville, Tenn., in n.e. corner, on Southern River; pop. 6784; furniture, tobacco, flour, lumber; Tusculum College; *map* T-46
 home of Andrew Johnson J-222: national monument N-20
 Greenfield, Mass., manufacturing town on Connecticut River, 33 mi. n. of Springfield; pop. 15,672; taps, dies, tools, silverware, paper: *map* M-82
 Greenfield Village, an historic village created by Henry Ford at Dearborn, Mich. in which the handicraft arts of the past are represented in their natural settings: F-153, *table* M-393. *See also* Edison Institute
 Green fly, a green aphid.
 Green gage plum P-260
 Green gold A-133
 Green heron S-297
 nest, *picture* B-127
 Greenland, island n.e. of America; almost wholly within Arctic Circle; estimated area, 735,000 to 1,250,000 sq. mi.; pop. 18,000: G-175-6, *maps* G-176, A-277
 Eskimos E-300
 explorations H-348, P-98
 ice-cap G-95, P-285, I-2a: icebergs from I-4
 U. S. occupation W-1780, G-176
 Greenland halibut H-200
 Greenland right whale. *See in Index* Bowhead
 Greenland Sea, in Arctic, *map* A-190
 Greenland seal S-70
 Greenlet, or vireo V-303. *See also in Index* Vireo
 Green monkey M-229
 Green Mountain Boys V-288
 Ethan Allen leads A-129
 Green Mountains, range of Appalachian system extending through Vermont; highest peak, Mt. Mansfield (4393 ft.) V-286, *map* N-86
 Green Mountain State, popular name for Vermont.
 Greenock (*grēn'ōk*), Scotland, seaport 20 mi. n.w. of Glasgow; pop. 79,000; shipbuilding, sugar refining, *map* E-270a
 Greenough (*grēn'ō*), Horatio (1805-52), American sculptor, born Boston; designed Bunker Hill Monument and colossal statue of Washington in Washington, D. C.: S-62
 Green plover. *See in Index* Lapwing
 Green River, in Kentucky, 350 mi. long; joins the Ohio River s.e. of Evansville, Ind.: *map* K-11
 Green River, rises in Wyoming; unites with Colorado in s.e. Utah; 650 mi. long: C-315, *maps* U-264, W-194
 Greensand, a clay or sand, colored green by glauconite M-184
 New Jersey deposits N-92, P-324
 Greensboro, N. C., manufacturing city 70 mi. n.w. of Raleigh; pop. 59,319; cotton, cigars, terra cotta, chemicals, brick, hosiery; insurance center; Greensboro College and Woman's College of University of North Carolina; Bennett College, for Negro women, and Negro Agricultural and Technical College; named for Nathanael Greene: *map* N-156

Greensboro College, at Greensboro, N.C.; founded 1838 by Methodist Episcopal church; for women; arts and sciences, music.
 Greensburg, Pa., center of a coal-mining, coking, and natural gas region, 26 mi. s.e. of Pittsburgh; pop. 16,743; iron, steel, and glass products; Seton Hill College.
 Green soap S-177
 Greenstone. *See in Index* Diabase
 Green tea T-26, 27
 preparation, *picture* T-23
 Green turban, a shell S-108
 Green turtle T-167
 Greenville, Miss., cotton-trading and manufacturing center; pop. 20,892; 95 mi. n.w. of Jackson on Mississippi River: *map* M-200
 Greenville, N. C., city 73 mi. s.e. of Raleigh; pop. 12,674; large tobacco market and warehouses; founded 1786, named for Gen. Nathanael Greene; teachers college.
 Greenville, Ohio, city in w. 34 mi. n.w. of Dayton; pop. 7745; large gravel-producing plant; scene of Gen. Anthony Wayne's Treaty of Greenville with Indian tribes
 Wayne's treaty with Indians W-59
 Greenville, S. C., important textile-making city and cotton market in extreme n.w.; pop. 34,734; Furman University: S-214, *map* S-213
 Greenville, Tex., trade center 50 mi. n.e. of Dallas; pop. 13,995; cotton-growing, agricultural, and horticultural section: *map* T-56
 Greenville, Treaty of W-59
 Green vitriol, sulphate of iron S-324
 in ink I-79
 Greenway, John C. (1872-1926), soldier and mining engineer, born Huntsville, Ala.; officer in Spanish-American War and 1st World War; promoted copper mining in southwest.
 Greenwich (*grēn'wich*, also *grēn'ich*), Conn., summer resort 28 mi. n.e. of New York City; pop. 35,509; founded by Dutch in 1648; scene of Revolutionary War battle: *map* C-336
 Greenwich (*grin'ij*), England, borough of London on Thames River; pop. 101,000; naval hospital and college; famous Royal Observatory on prime meridian: L-70, *map* E-270a
 Greenwich time T-95, *chart* T-96
 Greenwich (*grēn'ich*) Village, New York City N-127
 Greenwood, Sir Hamar (born 1870), British statesman; under-secretary of state for Home Affairs 1919; chief secretary for Ireland 1920-22.
 Greenwood, Miss., city on Yazoo River 86 mi. n. of Jackson; pop. 14,767; cotton market; cotton products, farm implements, drugs.
 Greenwood, S. C., city 67 mi. n.w. of Columbia; pop. 13,020; cotton, silk hosiery, lumber, machine shop and creamery products; Bailey Military Academy, Lander College.
 Greet, Sir Philip Ben (1857-1936), English actor and manager; presented Shakespeare's plays as done in Elizabethan times.
 Gregg, John Robert (born 1867), American educator and author born Ireland, emigrated to U. S. (1893); founder of Gregg system of shorthand and author of textbooks connected with system.
 Gregg shorthand S-134-5
 Gregor (*grēg'ēr*), William (1761-1817), English clergyman and mineralogist, discoverer of titanium.
 Gregorian calendar C-22-3
 Gregorian chants M-309

Gregory, the Illuminator, Saint (257?-337?), reputed founder and patron saint of Armenian church; festival October 1: A-302
 Gregory, popes. In addition to those below, *see in Index* Pope, *table*
 Gregory I, the Great (540?-604), pope; commemorated as saint March 12: G-176-7
 church music M-309
 sends Augustine to England C-76
 Gregory VI (died 1047), pope G-177
 Gregory VII, Hildebrand (1020-85), pope; commemorated as saint May 25: G-177
 investiture conflict H-274-5, G-177
 Gregory IX (1145?-1241), pope G-177
 Gregory XI (1331-78), pope G-177
 Gregory XII (1327?-1417), pope G-177
 Gregory XIII (1502-85), pope 1572-85
 calendar reform C-22
 Gregory XVI (1765-1846), pope G-177
 Gregory, Lady Isabella Augusta (1852-1932), Irish dramatist and romance writer, associated with Yeats in Irish literary revival ('Gods and Fighting Men'; 'Irish Folk History Plays'): I-132
 Gregory, St., Knights of. *See in Index* Knights of St. Gregory
 Gregory of Nazianzus, Saint (329?-389?), Churchman whose writings contain best statement of doctrine of Trinity in Greek orthodox theology; a graceful and powerful expounder but not an original thinker; festival May 9.
 Gregory of Nysa, Saint (331?-386?), Greek churchman who anticipated transubstantiation doctrine; constructive thinker; festival March 9.
 Gremlins, in folklore, pixies that play tricks, especially on aviators; may be devilish, or good-humored and beneficent; the young are called widgeots, the females fifinellas; first reported by R.A.F. fliers in 1923; name said to be from obsolete English verb *greme*, meaning "to vex."
 Grenada (*grē-nā-dā*), southernmost of Windward Islands, British West Indies, 90 mi. n. of Venezuela; 133 sq. mi.; pop. 90,000; cap. St. George; cocoa, nutmegs, spices, cattle; health resort: *map*, inset N-150c
 Grenade (*grē-nād'*) (from French *grenade*, pomegranate), military weapon; made of steel, containing high explosives, sometimes gas or flame producing chemicals; made to be thrown by hand or rifle; used in 17th century; highly developed during first World War.
 Grenadier, originally a soldier whose special duty was to throw hand grenades. As these were picked men, chosen for their boldness and strength, the term came to be applied to members of a special corps.
 Grenadine (*grēn-ā-dēn'*), a silk, cotton, or wool fabric similar to marquisette in weave.
 Grenadine, a reddish, sweet sirup made from pomegranate juice.
 Grenadines (*grēn-ā-dēnz'*), group of about 600 small islands in British West Indies stretching for 60 mi. between Grenada and St. Vincent.
 Grendel, monster slain by Beowulf B-97
 Grenfell, Sir Wilfred Thomason (1865-1940), British medical missionary in Labrador G-177-8
 Grenoble (*grū-nō'blū*), France, fortified city on Isère River 60 mi. s.e. of Lyons; pop. 95,000; university.
 Grenville, George (1712-70), English statesman; prime minister 1763;

Key—cāpe, āt, fār, fāst, what, fāl; mē, yēt, fēr, there; ice, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rȳde, fȳll, būrn;

- secured passage of American Stamp Act, one of causes of American Revolution: R-82
- Grenville, Sir Richard** (1541?-91), English naval hero; commanded fleet carrying colonists to Roanoke Island in 1585; killed when his ship *Revenge* tried to cut way through Spanish fleet (read Tennyson's 'Revenge').
- Grenville, William Wyndham, Baron** (1759-1834), English statesman, son of George Grenville; as premier (1807) secured abolition of English slave trade; advocated Catholic emancipation.
- Gresham, Sir Thomas** (1519-79), English merchant and royal financial agent; founder of Royal Exchange and Gresham's College.
- Gresham, Walter Quinton** (1832-95), American jurist and statesman; major-general in Civil War; secretary of treasury 1884; secretary of state 1893; as postmaster general barred all lotteries from mails.
- Gresham's law**, in economics, principle that "bad money drives out good"; tendency of money having less intrinsic value to displace more valuable money from circulation: M-220b
- Gretchaninof, or Grechaninoff** (*gră-chă'ně-nôf*), Alexander T. (born 1864), Russian composer; songs, symphonies, operas ('Dobrynya Nikitich'; 'Sister Beatrice').
- Gretchen**, in Faust legends F-20
- Grethel**, Gammer, old German woman whose stories formed basis of Grimm's fairy tales S-301
- Gretna, La.**, industrial city on Mississippi River, opposite New Orleans; pop. 10,879; oil refineries.
- Gret'na Green**, village of Dumfriesshire in s.w. Scotland near English border; formerly scene of runaway marriages from England.
- Greuze** (*grüz*), Jean Baptiste (1725-1805), French genre and portrait painter; in painting, like Rousseau in literature, he represents a sentimental return to nature ('The Broken Pitcher'; 'Innocence').
- Greville, Charles C. F.** (1794-1865), English public official and diarist whose journals (published 1875-87) contain rich historical material for first half of 19th century.
- Grevillea** (*grě-vî'ě-ă*), or silk-oak, a perennial (*Grevillea robusta*) of the protea family, native to Australia. Used as house plant; erect, leaves fernlike; grows to 70 ft. in California and used as shade tree; in Australia attains 150 ft.; flowers orange, in clusters. Lumber elastic, durable, used in furniture; gum resin derived from wood. Over 200 species in genus, mostly Australian; valuable lumber source.
- Grévy** (*gră-vě'*), Jules (1807-91), French statesman, president of French Republic 1879-87; resigned owing to scandals involving his son-in-law in traffic in offices and decorations of honor.
- Grew, Joseph Clark** (born 1880), diplomat, born Boston; for many years in U.S. Foreign Service; ambassador to Japan 1932-41; made special assistant to Secretary of State Cordell Hull Sept. 1942.
- Grey, Albert Henry George, 4th Earl** (1851-1917), governor general of Canada 1904-11; stimulated social and economic progress.
- Grey, Charles, 2d Earl** (1764-1845), English statesman; premier 1830-34
Parliamentary Reform Bill R-177
- Grey, Edward Grey, first Viscount.** See in Index Grey of Fallodon
- Grey, Lady Jane** (1537-54), "nine-days' queen" of England G-178
- Grey, Zane** (1875-1939), American novelist, born Zanesville, Ohio; author of romantic and thrilling stories of western life in U.S. ('Desert Gold'; 'Riders of the Purple Sage'; 'Lone Star Ranger') quoted on New Mexico N-94
- Greyhound D-79, D-82, picture D-80**
- Greylock, Mount**, highest peak in Mass., in Berkshire Hills (3505 ft.).
- Greymouth** (*gră'mūth*), New Zealand, seaport on w. coast of South Island at mouth of Grey River; gold, coal, lumber; pop. 8000: maps A-372a, P-10b
- Grey of Fallodon, Edward Grey, first Viscount** (1862-1933), English Liberal statesman, foreign secretary 1905-16, most conspicuous figure in European politics during that decade; with Edward VII arranged Triple Entente; in 1914 worked vainly to prevent World War; signally successful in maintaining friendly relations with neutrals during early years of the war; raised to peerage 1916; temporary ambassador to U. S. 1919.
- Grey Owl** (Wa-Sha-Quon-Asin) (1888-1938), Canadian Apache Indian author, naturalist; built wild life sanctuary, Prince Albert National Park ('Pilgrims of the Wild'; 'Sajo and the Beaver People').
- Greysolon, Daniel, Sieur du Lhut.** See in Index Du Lhut
- Greytown, Nicaragua.** See in Index San Juan del Norte
- Griboviedof** (*grě-bô-yěd'ôf*), Alexander (1795-1829), Russian dramatic poet and statesman; sent to Persia as minister, where he was killed by a mob; famous for one comedy, 'Misfortune from Intelligence', a satirical drama showing Russian manners and social struggle between older and younger generation.
- Grid, in vacuum (radio) tube R-21, 22**
bias R-21
circuit R-21
condenser R-21
leak R-21
screen R-23, pictures R-22
- Gridiron**, a football field, so called from its shape F-150
- Grids, or resistance elements, in street-cars S-307**
- Grieg** (*grěg*), Edvard Hagerup (1843-1907), Norwegian composer G-178
- Griffes, Charles Tomlinson** (1884-1920), composer and pianist, born Elmira, N.Y.; work impressionistic and individualistic ('The Pleasure Dome of Kubla Khan'; 'Four Roman Sketches'): M-316
- Griffin, Walter Burley** (born 1876), American architect, planner of Australian capital C-70
- Griffin, Ga.**, city 37 mi. s. of Atlanta; pop. 13,222; textile and hosiery mills, canning plants for pimientos, fruits and vegetables; U. S. agricultural experimental station.
- Griffin**, a mythical creature, half eagle, half lion, supposed to guard hidden treasure.
- 'Griffin', La Salle's ship L-66**
- Griffith, Arthur** (1872-1922), Irish statesman; organizer of Sinn Fein; became president of Irish Republic succeeding De Valera 1922 on negotiation of peace with Great Britain.
- Griffith, David Wark** (born 1880), American motion picture director; born La Grange, Ky.; began as stage and motion picture actor; became director, then producer; pioneer in artistic construction of pictures: first to place emphasis by "cut-backs," "close-ups" ('Birth of a Nation', 'Broken Blossoms', silent pictures; 'Abraham Lincoln', talking picture).
- Griffith, Sir Samuel Walker** (1845-1920), Australian conservative lawyer and statesman; chief justice of Australia 1903-20.
- Grif'fon**, a hunting dog D-82
- Griffon, Brussels**, a toy dog D-82
- Grigg, Sir James** (born 1890), Britain's war minister, appointed February 1942; one of few men (perhaps only one) to rise from civil service to cabinet position.
- Grijalva** (*grě-hă'l'vă*), Juan de (1489?-1527), Spanish navigator, discoverer of Mexico; sailing from Cuba where his uncle, Diego Velásquez, was governor, explored Mexican coast as far as Vera Cruz; active in conquest of Nicaragua and slain there in an Indian outbreak: C-372
- Grijalva River**, in s. Mexico; called Chiapas in upper course; 350 mi. long, navigable for 90; unites with Usumacinta.
- Grillparzer** (*grîl'pärt-sēr*), Franz (1791-1872), Austrian dramatic poet; a master of dramatic technique; works include classical dramas ('The Golden Fleece', a trilogy; 'Sappho'), historical tragedies, and romantic dramas.
- Grilse**, an immature salmon S-13
- Grimal'di, Joseph** (1779-1837), famous English clown; Charles Dickens edited his 'Memoirs'.
- Grimaldi**, a prehistoric Negroid race whose remains were discovered in s. France, associated with remains of the Cro-Magnon race: M-46
- Grimes, Bryan** (1828-80), Confederate soldier, born in Pitt County, N.C.; major of Fourth North Carolina Regiment in Civil War; made major general in 1865 and served in last battles of Lee's army.
- Grimm, Jakob** (1785-1863), German scholar, founder with his brother Wilhelm (1786-1859) of science of folk-lore F-134
- 'Fairy Tales' L-159-60, picture L-161**; influence on story-telling S-301
- pioneer in philology P-171**
- Grimmelshausen** (*grîm'měls-hou-zěu*), Hans Jakob Christoffel von (1625?-76), German writer and adventurer; served in Thirty Years' War. 'The Adventurous Simplicissimus', a highly realistic adventure story, is based largely on his own experiences and written in the manner of the picaresque novel.
- Grims'by, or Great Grimsby**, seaport on n.e. coast of England, near mouth of Humber River; pop. 92,000; immense fishing trade; timber, coal trade; shipbuilding history dates from 8th cent.: map E-270a
- Grinding machine**, a tool T-111, 112
principle of grinding wheel C-134
- Grinding teeth, or molars T-28, pictures T-29**
- Grinding tools T-111, 112**
- Grind of the Navir** (Gate of the Giants), Shetland Islands S-116
- Grindstone**, a circular abrasive stone for grinding edge tools such as ax; made to turn on axle; used dry or with water
cut from Ohio sandstone O-210
emery wheels E-260
- Gringo** (*grîng'gō*), nickname for an American N-143
- Grinnell, George Bird** (1849-1938),

ü=French u, German ü; gem, gō; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

- American writer, ethnologist, and ornithologist, born Brooklyn; editor *Forest and Stream* 1876-1911; founded first Audubon society; author of books on American Indians: S-303k
- Grinnell, Henry (1799-1874), American shipowner, born New Bedford, Mass.; financed Franklin relief expeditions (1850 and 1853-55) and later Arctic explorations; Grinnell Land is named for him.
- Grinnell, Iowa, city 45 mi. n.e. of Des Moines; pop. 5210; Grinnell College: map I-120
- Grinnell College, at Grinnell, Iowa; established 1846 (opened 1848); arts and sciences, music.
- Grinnell Land, Canada, cent. part of Ellesmere Island, n.w. of Greenland; discovered 1850 by Grinnell expedition.
- Griqualand (*grē'kwā-lānd*), East, a native territory of Cape of Good Hope province, Union of South Africa; 6602 sq. mi.; pop. 330,000.
- Gris (*grēs*), Juan (1887-1927), Spanish modernist painter and lithographer, born Madrid; removed to Paris 1905 and became identified with cubist movement.
- Grisel'da, figure of romance, famed for her patience
Chaucer heroine, picture C-162
- Grisi (*grē'sē*), Giulia (1811-69), Italian dramatic soprano, greatest of her day.
- Gris-Nez (*grē nā*) ("Gray nose"), Cape, headland of France, point of French coast nearest Britain.
- Grisson (*grī'sūn*), a weasel-like carnivorous mammal of family *Mustelidae* found in Central and South America and Mexico; dark beneath, light above; emits disagreeable odor when annoyed; scientific name *Galiictis*, or *Grisson*, *vittata*.
- Grisons (*grē-zōn'*), easternmost and largest canton of Switzerland; 2746 sq. mi.; pop. 126,000; noted for superb Alpine scenery, especially in the Engadine: S-353 language S-351
- Gristle. See in Index Cartilage
- Griswold, Rufus Wilmot (1815-57), editor and author, born Benson, Vt.; in 1850 he helped to edit writings of Edgar Allan Poe who had named him as his literary executor.
- Grits, hominy C-368
- Grizzly bear B-68, picture B-69
- Grizzly Giant, big tree S-80, Y-208
- Groat (*grōt*) (from Dutch *groot*, "big"), name given to English silver four pence, worth about 8 cents in U. S. money; term once applied to any large, thick coin.
- Grodno (*grōd'nū*), formerly Gardinas, city in n. Poland, on Niemen River; pop. 62,000; interesting old buildings; varied manufactures; trade in grain, timber: map P-278
- Grofé (*grō-fā*'), Ferde (Ferdinand Rudolph von Grofe) (born 1892), composer, born New York City; member Los Angeles Symphony Orchestra; pianist and arranger for Paul Whiteman; exponent of "symphonic jazz" ('Mississippi Suite'; 'Grand Canyon Suite'; 'Symphony in Steel').
- Grogan, E. S. (born 1874), British military officer and explorer, born Winchester, England; traveled through Africa, Australasia, the Americas; in collaboration with Arthur Sharp, his traveling companion, wrote 'From the Cape to Cairo'.
- Groin, in architecture A-261 vault, picture A-268
- Groller (*grō-lē-yā'*), Jean, Vicomte d'Aguisy (1479-1565), French bibliophile and statesman; ambassador to Rome and Milan and treasurer under Francis I; collected library of 3000 beautifully bound books; Grollier Club, a club of book collectors in New York City, named for him: B-183
bookbinding B-183, picture B-182
book collecting B-188
- Gromwell, a genus (*Lithospermum*) of hairy plants of the borage family found in n. hemisphere. Low-growing, hardy; flowers white, yellow, or bluish, grow in leafy spikes; seeds small, polished, stone-like; used in rock gardens. Includes the puccoon.
- Groningen (*grō'ning-ēn*, Dutch *krō'-ning-kēn*), seaport and chief city of n.e. Netherlands; pop. 105,000; numerous canals; large trade, various manufactures, shipbuilding; university: map B-87
- Gröninger (*grū'ning-ēr*), Gerard (1582?-1652), German sculptor S-59
- Gröninger, Johann Mauritz (died 1607), German sculptor; lesser known member of Gröninger family; father of Johann Wilhelm Gröninger (1675?-after 1732), known for his garden pieces.
- Groot, Hugo de. See in Index Grotius
- Grooch, William Stephen (1889-1939), American aviator and writer; after flying for the Navy in 1st World War, blazed airline trails to South America and across the Pacific ('Winged Highway'; 'Skyway to Asia', 'From Crate to Clipper' tell of his flights).
- Gropius, Walter (born 1883), architect, born Berlin, Germany; in U.S. after 1937; director of Bauhaus, school in Germany (see in Index Bauhaus); professor and chairman, Dept. of Architecture, Harvard University; exponent of functionalism; favorite materials glass, metal, and concrete.
- Gropper, William (born 1897), painter and illustrator, born New York City; skilful as social satirist; depicts realistically current happenings, such as 'The Last Cow', a dust bowl scene.
- Gros (*grō*), Antoine Jean, Baron (1771-1835), French historical painter; pupil of David; through Josephine was favored by Napoleon and is noted for Napoleonic war scenes; at end of Napoleon's power turned to purely classical subjects; adverse criticism led to suicide.
- Grosbeak, various stout-beaked birds of the finch family G-178-9
black-headed, color plate B-138
cardinal C-82-3, picture F-35
food habits B-122
rose-breasted G-178, color plate B-138
- Groschen (*grō'shēn*), former Austrian bronze coin worth \$.0014; also former German silver coin, worth 2 cents.
- Groselliers (*grō-zē-yā'*), Medard Chouart des (1621-84?), intrepid French explorer and fur trader, brother-in-law of his companion Radisson
fur trade F-223-5
Minnesota M-194
Wisconsin W-126
- Grosgrain (*grō's-grān*), a firm, stiff, closely woven, corded silk.
- Gros Michel (*grō mē-shēl'*), a variety of banana B-38
- Gros point embroidery T-66, picture T-68
- Gross, numerical unit equaling twelve dozen.
- Grosse Pointe Park, Mich., village adjoining Detroit on e.; residential suburb; pop. 12,646.
- Gross national product, the value in dollars of the commodities and services produced by the nation over a given period of time less the value of the materials used up in the production of the goods and services.
- Gross tonnage S-130
- Grosswarden (*grōs-vār-din'*). See in Index Oradea-Mare
- Grosvenor (*grō'ven-ōr*), Gilbert Hovey (born 1875), American geographer, born Constantinople, Turkey; with *National Geographic Magazine* since 1899; editor-in-chief since 1903; made president National Geographic Society 1920.
- Gros Ventres (*grō vūn'trū*), French name for Hidatsa or Minitari tribe of Plains Indians of Siouan stock on upper Missouri River in N. D.
- Grote, George (1794-1871), English historian and banker; his 'History of Greece' is "one of the few great comprehensive histories."
- Grotius (*grō'shū-ūs*), Hugo (1583-1645), Dutch statesman and jurist, "father of modern science of international law"; tomb at Delft: I-108
neutrality doctrine, quoted N-75a
tomb N-69
- Groton (*grō'tōn*), Conn., town on Thames River opposite New London; pop. 4719; site of Fort Griswold, where Tories under Benedict Arnold massacred Americans 1781: map C-336
- Grouchy (*grō-shē'*), Emmanuel, Marquis de (1766-1847), French marshal, to whose delay at Waterloo Napoleon's defeat is attributed: W-48
- Ground, in radio R-19
symbol for R-24
- Ground bass, in music M-310
- Ground-beetle, a beetle of the family *Carabidae* B-83, picture B-81
- Ground bumblebee, color plate W-32a-b
- Ground cuckoo. See Roadrunner
- Ground Forces, U. S. Army A-306, 307
- Ground hemlock Y-206
- Groundhog, or woodchuck, a burrowing rodent G-179, picture N-29c
hibernation H-288-9
- Groundhog Day (February 2) G-179, H-320
- Ground holly, wintergreen, or checkerberry W-114
- Ground-ivy I-176
- Ground laurel, or trailing arbutus A-248
- "Groundlings," in Elizabethan theater S-100
- Ground-nesting termite T-52a, b
- Groundnut, name for peanut and other similar nuts P-94
- Groundpine, name given to several species of club mosses (*Lycopodium*) because of their likeness to miniature pine trees; used for Christmas decorations. See in Index Lycopodium
- Ground rattlesnake, or pigmy rattlesnake, a poisonous snake (*Sistrurus miliarius*), found in s.e. United States; gray body with black saddles; reaches a length of about 2 ft.
- Groundsel, a genus of plants of the composite family. See in Index Senecio
- Groundsel, common, a low-growing annual weed (*Senecio vulgaris*) of

Key—cāpe, āt, fār, fāst, whqt, fqlł; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, bāt, rȳde, fȳll, bārn;

- the family *Compositae* with leafy branching stem; leaves pinnate and toothed; flower heads yellow; name also applied to entire genus *Senecio*.
- Ground squirrel, name given to various squirrel-like rodents that live on the ground S-265-6
- Ground-water, source of springs S-263
- Group, in U. S. Army Air Forces A-307
- Grouper, name given to southern members of the sea-bass family; large, voracious fishes with small scales and pale flesh; among commonest are Nassau grouper, red grouper or mero, yellow-fin grouper, jew-fish, red hind, and rock hind Nassau grouper, picture P-355
- Group insurance I-95, S-179
- Group life. See in *Index* Sociology
- Group medicine C-344
- Grouse G-179-81, pictures G-179, 180
- courthouse G-180, pictures B-126, G-180
- protective coloration G-180, P-354
- Grove, Frederick Philip (born 1872), Canadian novelist, noted for his realism ('Settlers of the Marsh'; 'Our Daily Bread').
- Grove, Sir George (1820-1900), English engineer and writer on music; erected lighthouses in West Indies; chiefly known for his services to music; director Royal College of Music from its foundation in 1882 to 1894; editor-in-chief 'Dictionary of Music and Musicians'; author 'Beethoven and His Nine Symphonies'.
- Grove, Sir William Robert (1811-96), English physicist and judge; invented Grove battery; author of 'The Correlation of Physical Forces'.
- Grove City College, at Grove City, Pa.; founded 1876; arts and sciences, commerce, music.
- Grow, Galusha A. (1823-1907), American politician, born Ashford, Conn.; U. S. congressman 1851-63; Speaker of House 1861-63; introduced first homestead bill.
- Growth, increase in size
- biochemical problem B-110
- cell division C-122
- child development C-197-202
- enzymes affect E-298-9
- food factors F-145
- glands affect G-99-100
- plant, promoted P-245e-f
- rapid in: bamboo B-35; grass G-137
- trees marked by "rings" T-131
- 'Growth of the Soil', a simple, almost plotless novel by Knut Hamsun picturing Norwegian peasant life.
- Grub, larva of beetle B-82
- Grubstreet, defined by Dr. Johnson J-224
- Gruenberg, Louis (born 1884), American composer, born Russia; brought to United States in babyhood; developed from pianist into composer, chiefly of syncopated, impressionistic operas ('Emperor Jones'; 'Jack and the Beanstalk'; 'Enchanted Isle'; 'Jazz Suite').
- Gru-gru nut, edible fruit of the gru-gru palm of South America and the West Indies; source of valuable oil; sometimes used for beads: N-188
- Gruiformes (*gry-i-fôr'méz*), an order of marsh birds, comprising cranes, limpkins, rails, gallinules, coots.
- Grundschule (*grunt'shq-lé*), German school G-74
- Grundtvig, Nikolai Frederik Severin (1783-1872), Danish poet, philologist and theologian, born in Zealand; advocated religious and civic freedom; collected Danish folk songs ('Northern Mythology', a study of Old Norse; 'The Decline of Heroic Life in the North', a long epic poem)
- Danish folk schools D-52
- Grundtvig (*grunt'vîk*) "pipe organ" church, Copenhagen, picture B-266
- Grundy, Mrs., the personification of society's judgments: name originated in old play 'Speed the Plough', where a character asks continually, "What will Mrs. Grundy say?"
- Grünwald (*grü'nê-vâlt*), Matthias (1432?-1529?), German painter of late Gothic period; powerful color, brutal realism, strong emotion (the Isenheim altar, Crucifixions).
- Grunt, a large family of food-fishes (*Haemulidae*) of tropical seas. The name comes from their ability to make a grunting noise.
- Gruyère (*grü-yêr*) cheese C-165
- Gruyères, Switzerland, picturesque town perched on a high hill 16 mi. s. of Fribourg; pop. 2000; famous for its cheeses.
- Guadalajara (*gwâ-dâ-lâ-â-râ*), second city of Mexico, and capital of Jalisco; pop. 185,000; 275 mi. n.w. of Mexico City; center of Mexican steel and glass industries; Indian pottery; silver mining and farming region; health resort; severe earthquakes 1875 and 1912; city founded 1531; contains relics of Spanish colonial times; has university and splendid cathedral: M-133, map M-133, picture M-134
- Guadalquivir (*gwâ-dâ-lâ-vê-yâr*) (Arabic "white river"), also Turia, a river in Spain, 150 mi. long; its waters irrigate fertile plain around Valencia and give city most of its water supply
- harbor V-269
- Guadalupe (*gwâ-thâl-kâ-nâl*), also *gwâ-dâl-kâ-nâl*, one of the Solomon Isls., 90 mi. long, about 20 mi. wide; chiefly mountainous; captured from Japanese by American forces in 2d World War after fierce battles Aug. 9, 1942-Feb. 9, 1943: W-178y. See also in *Index* Solomon Islands
- Guadalquivir (*gwâ-dâl-kê-vêr*) (Arabic "great river"), river in Spain, 350 mi. long; rises in e. of province of Jaen; flows s.w. through Seville and Cádiz into Atlantic, 20 mi. n. of Cádiz: S-86, map S-226
- Guadalupe (*gwâ-dê-lôp* or *gwâ-dâ-lôp*), island in Pacific Ocean, 75 mi. off coast of Lower California; rises from an oceanic abyss; 15 mi. long sea elephants S-70
- Guadalupe-Hidalgo (*ê-dâl'gô*), Mexico, town 3 mi. n. of Mexico City, where treaty was signed 1848 ending Mexican War
- treaty terms M-132
- Guadalupe Peak, or El Capitan, highest point in Texas (8751 ft.), in Guadalupe Range lying between Rio Grande and Pecos rivers, in Texas and New Mexico.
- Guadalupe River, Tex., rises in s.w. central part and flows s.e. to point about 20 mi. from Gulf of Mexico, where it divides, one branch uniting with San Antonio River, and other emptying directly into San Antonio Bay: map T-56
- Guadeloupe (*gwâ-dê-lôp* or *gwâ-dê-lôp*), French possession in West Indies; 688 sq. mi.; pop. more than 300,000: G-181, map, inset N-150c
- Guadiana (*gwâ-dê-â-nâ*), a river of Spain and s.e. Portugal; about 500 mi. long, navigable for only 40 mi. from mouth; flows into Gulf of Cádiz: P-312, map S-226
- Guaiac (*gwî'âk*), a resin obtained from the *lignum vitae* or *guaiacum*, a tree native to the West Indies and northern South America.
- Guam (*gwâm*), island possession of U. S. in w. Pacific; 206 sq. mi.; pop. 22,293; cap. Agaña: G-181, map P-107, pictures P-107
- Guan (*gwân*), a turkey-like bird of Central and South America, belonging to the same family as the curassow; it has dark green or black plumage, a long graceful tail, and a throat almost bare and usually with a pendant wattle; one species, called the "chacalaca" from its harsh loud cry, ranges n. through Texas.
- Guanabacoa (*gwâ-nâ-bâ-bâ'ô*), town in Cuba, 6 mi. e. of Havana; pop. 17,000; summer resort; medicinal springs.
- Guanaco (*gwâ-nâ'ô*), wild South American ruminant of the camel family L-173
- hide used, picture S-205f
- Guanajuato (*gwâ-nâ-huâ'tô*), state in central Mexico; rich in silver and other minerals; 11,804 sq. mi.; pop. 990,000; cap. Guanajuato.
- Guanajuato, formerly Santa Fé de Guanajuato, Mexico, historic city 165 mi. n.w. of Mexico City; pop. 31,000; gold and silver mining; first battle in Mexican war of independence fought here in 1810: map M-133
- Guanchos (*gwân'chôz*), Hamitic people, natives of Canary Islands, originally tall, blond, athletic, but later mixture with Arabs changed these characteristics; by language allied to ancient Numidians.
- Guano (*gwâ'nô*), a fertilizer formed by the excrement and carcasses of sea-birds; composed of phosphoric acid, nitrogen, and potash; name also applied to other manures, such as bat or fish guano
- bat B-64
- Pacific islands P-9
- penguin P-110
- Peruvian islands S-208l, picture S-205f
- Guantanamo (*gwân-tâ-nâ'mô*), Cuba, town on Guaso River near head of fine harbor on s. coast; pop. 14,000.
- Guantanamo Bay, Cuba, U. S. naval base C-410, N-52, maps C-412, N-51
- Guarani (*gwâ-râ'nê*), tribe of South American Indians; their descendants form bulk of population of Paraguay and Uruguay, and are important element in Bolivia and Brazil: P-67
- Guarantee, in law, a contract by which one person is bound to pay a debt or perform a duty in case the person who is primarily liable fails to do so.
- Guardafui (*gwâr-dâ-fuê*), Cape, extreme eastern point of Africa; promontory of Somaliland at entrance to Gulf of Aden: map A-242
- Guardi (*gwâ'r'dê*), Francesco (1712-93), Italian artist of late Venetian school; known for colorful and luminous Venetian landscapes.
- Guardian, in law, name generally given to one who has control of person and property of one under 21 years; also to one who has control of person or property, or both, of one unable to care for himself, as a lunatic, drunkard, etc.
- "Guard the Blind," Danish game P-252, picture P-252
- Guarini (*gwâ-rê'nê*), Giambattista (1537-1612), Italian poet; wrote 'Il Pastor Fido'; like Tasso's 'Aminta' on which it is patterned, it is a lyric conception of the ideal life; identifies happiness with simple

û=French u, German ü; gem, gô; thin, #æ; ù=French nasal (Jeu); zh=French j (z in azure); κ=German guttural ch

rustic life; 'Il Pastor Fido' and 'Aminta' are the finest pastoral poems in Italian literature.

Guarneri (*gŭär-nä're*), Guarneri, or Guarnerius, celebrated family of Italian violin-makers, 17th and 18th centuries, of whom most celebrated was Giuseppe Antonio (1687-1745): V-302

Guarrazar (*gŭär-ä-thär*) (Huertas y Fuente de Guarrazar), place near Toledo, Spain

Visigothic relics G-25, picture G-27

Guatemala (*gŭä-tä-mälä*), republic of Central America; 45,452 sq. mi.; pop. 3,284,269; cap. Guatemala City: G-181a-d, maps G-132, N-150c. See also in Index Central America

architecture, pictures G-181d, L-67j

earthquake of 1917 E-136

farm land, picture C-133

flag F-95, color plate F-88

forced labor G-181b, C-133a

government G-181d

history G-181d, C-133c

literature L-67v

marimba players, picture L-67l

Maya civilization Y-211, A-147-8, G-181d

shelter: jungle home, picture C-133a

Guatemala City, cap. of Guatemala, railroad and commercial center; pop. 175,000; 50 mi. from Pacific coast; textiles; pottery: G-181a earthquake of 1917 E-136

Guava (*gŭä-vä*), a small fruit grown in tropics F-212

Guaviare (*gŭä-vä-ä-rä*) River, South America; rises in Andes, flows e. 700 mi. to Orinoco; little economic value: map C-305

Guayaquil (*gŭä-yä-käl*), chief seaport of Ecuador, South America; pop. 140,000; large foreign trade; shipyards: E-154, S-205e, map S-208b

Guayaquil, Gulf of, large inlet of Pacific in Ecuador; over 100 mi. wide at its mouth; narrows into estuary of Guayas River: E-154

Guayas (*gŭä-yäs*) River, in Ecuador; rises in w. Andes and flows s.w. into Gulf of Guayaquil; partly navigable: E-154

Guaymas (*gŭä-mäs*), seaport of Mexico on Gulf of California; railroad connections with U. S.; pop. 8000: map M-133

Guayule (*gŭä-yŭ-lä*, or *wi-yŭ-lä*), a perennial shrub (*Parthenium argentatum*) of the aster family G-181d-82

Gubbio (*gŭb-yŭ*), Italy, pop. 30,000; 18 mi. n.w. of Perugia; famous in Renaissance for maiolica ware; still being made

pottery P-331

Gudbrandsdal (*gud-bräns-däl*), central valley of Norway N-174

Gudenof, Boris. See in Index Boris Gudenof

'Gudrun' (*gŭd'rŭn*), a German epic poem of the Middle Ages, in three parts, full of sea adventures and battles. Gudrun, a princess, is carried away by the king of Normandy and held prisoner for 14 years, when her brother and Herwig, her true lover, rescue her.

Guebers. See in Index Ghebers

Guedalla (*gē-däl'lä*), Philip (born 1889), English biographer, historian and lawyer; combines sparkling, witty style with sound scholarship ('The Second Empire'; 'Conquistador'; 'Gladstone and Palmerston'; 'Bonnet and Shawl'; 'The Hundred Years').

Guelder-rose, or snowball, cultivated variety of high-bush cranberry C-391

Guelf (*gŭelf*), House of, Hanoverian rulers of England. See in Index Hanover, House of

Guelfs (*gŭelfs*) and Ghibellines (*gib-ē-lins*), political factions of medieval Germany and Italy G-182

Dante exiled by Guelfs D-11

Florence F-107

Otto IV, a Guelf O-256

Guelph, Ontario, city about 45 mi. w. of Toronto on Speed River; pop. 21,075; Ontario Agricultural College and Macdonald Institute; annual stock show; foundry products, rubber goods, sewing machines, farm machinery, linen: map C-50c

Guemal (*gŭämäl*), South American deer, distinguished by antlers which have only a single forking and by tusks in upper jaw of both sexes.

Guenevere. See in Index Guinevere

Guenon (*gŭ-nŭn*), an African monkey; species commonly used by organ-grinders and as pets: M-229

Guericke (*gä-rŭk-ŭ*), Otto von (1602-86), German physicist; studied law and mathematics in Germany and Holland: E-231

Guérin (*gä-rän*), Georges Maurice de (1810-39), French verse and prose writer; vivid, original style; works colored by intense love of nature

'The Centaur', specimen page, picture B-181

Guérin, Jules (born 1866), American painter and illustrator, born St. Louis, Mo.; had charge decorations San Francisco Exposition 1914 (decorations for Lincoln Memorial, Washington, D. C., and Pennsylvania R. R. station, N. Y. City).

Guernsey (*gŭern'zi*), 2d in size of Channel Islands; 25 sq. mi.; pop. 39,000; St. Peter Port and St. Sampson chief towns: C-139

Victor Hugo exiled to H-353

Guernsey cattle C-104, picture A-52

Guerrara (*gä-rä-rä*), Algeria, oasis, trading center for desert tribes: map A-127

Guerrero (*gä-rä-rö*), Vicente (1782-1831), Mexican revolutionary hero; president of Mexico 1829; when forced to retire put up armed resistance, but was finally captured and shot: M-142d

Guerrero, Mexico, state in s. on Pacific; 24,885 sq. mi.; pop. 640,000; cap. Chilpancingo; agricultural and mineral resources.

'Guerrière' (*gŭ-rŭ-yŕ*), British frigate in War of 1812 W-10

Guerrilla warfare, unorganized attacks carried on by independent groups or persons

Boer war B-167

China C-221o, W-178f

2d World War W-179f, picture W-178s

'Guessing Game' P-257

Guest, Edgar Albert (born 1881), American writer of verse, born Birmingham, England; came to U. S. 1891; with Detroit Free Press since 1895; immensely popular for more serious verse dealing with everyday life, also for humorous verse and sketches ('Just Folks'; 'When Day Is Done'; 'All That Matters').

Guggenheim, famous family of American mining capitalists, industrialists, philanthropists, of whom best known are Benjamin (1855-1912); Simon (1867-1941), U. S. senator from Colo. (1907-13), who established scholarship fund for advanced study abroad in memory of son, John Simon; Daniel (1856-1930) who gave fund for promotion of aeronautics; Harry F. (born 1890) president aeronautics fund, ambassador to Cuba 1929-33.

Guggenheim Foundation. See in Index John Simon Guggenheim Memorial Foundation

Guiana (*gē-yä-nä*), a region in n.e. South America comprising British Guiana (90,000 sq. mi.; pop. 340,000), Dutch Guiana (54,300 sq. mi.; pop. 180,000), and French Guiana (34,750 sq. mi.; pop. 37,000): G-182-3, maps G-183, S-208b, d

Raleigh's expedition to R-49

Guiana Highlands, region in n.e. South America S-208f, map S-208d

Guidi (*gŭē'dē*), Tommaso. See in Index Masaccio

Guido (*gŭē'dō*) of Arezzo, or Aretinus (995?-1050?), Benedictine monk; introduced modern system of music notation: M-318

Guido Reni (*rä-nē*) (1575-1642), Bolognese painter; pupil of Calvaert and the Carracci; great master in a school beginning to decline into sentimental insipidity

'Aurora and the Hours', picture A-365

Guienne (*gē-yēn*), ancient Aquitaine, former province of s.w. France; cap. Bordeaux: map F-179

Henry II of England acquires H-275

Hundred Years' War H-357, 358

Guignol (*gŭ-nŭl*), French puppet P-368c

Guilbert (*gŭl-bēr*), Yvette (born 1869), a Parisian singer unsurpassed in her day for dramatic and humorous rendition of old ballads.

Guilder. See in Index Florin; Gulden

Guildhall, old council hall in Cheap-side, London; fine statues; 2 giant wooden figures of Gog and Magog.

Guilds. See in Index Gilds

Guild socialism C-325

Guilford College, at Guilford College, N.C.; founded 1837 by Society of Friends; arts and sciences.

Guilford Courthouse, N. C., site of battle March 1781, between Greene and Cornwallis, 5 mi. n.w. of Greensboro; made national military park in 1917.

Guillaume (*gŭ-yŭm*), Charles Edouard (born 1860), French physicist, inventor of invar; 1920 Nobel prize winner in physics.

Guillemot (*gŭl'ē-mŭt*), a bird of the auk family

egg, picture E-193

Guillotine (*gŭl'ŭ-tēn*), French instrument of execution F-202

Guilmant (*gŭl-män*), Félix Alexandre (1837-1911), French organist and composer; foremost exponent of French school of organ music; works for organ, orchestra, choruses, and masses.

Guimaraes (*gŭ-mä-ränsh*), Portugal, town 35 mi. n.e. of Porto; birthplace of first king of Portugal; historical buildings and fortifications.

Guinea (*gŭn'i*), term loosely applied to entire west coast region of equatorial Africa, from Senegal river to Orange river in S. Africa; former slave trade: A-34

Guinea, a former English gold coin so named because gold of which it was coined originally came from Guinea Coast; term still used as money unit (21 shillings).

Guinea, Gulf of, the part of the Atlantic between Cape Palmas and Cape Lopez on w. coast of Africa, maps A-42a, b

Guinea-fowl G-183-4, color plate A-36c

Guinea-pig, or cavy G-184, P-155

inheritance of colors H-284

vitamin experiments V-311b

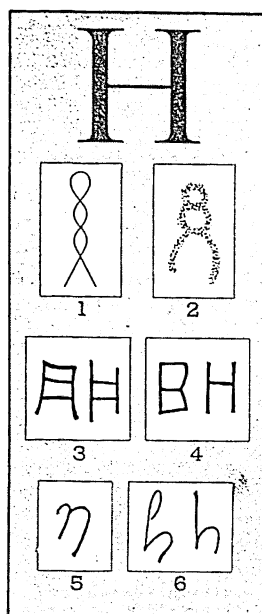
Guinea worm, a filaria W-180b

Key—cäpe, ät, fär, fäst, whät, fŭll; mä, yét, fērn, thäre; ice, bīt, rŭw, wŭn, fŭr, nŭt, dŭ; cäre, büt, rŭde, fŭll, bärn;

- Guinevere (*gwin'ê-vêr*), in Arthurian romance, Arthur's beautiful unfaithful queen R-160
- Guiney (*gī'ni*), Louise Imogen (1861-1920), American poet, born Boston ('The White Sail and Other Poems').
- Guira (*gwi'ra*) Falls, also Guayra, near and on border between Brazil and Paraguay on Paraná River; scenic attraction: map S-208b-c
- Guiscard, Robert. *See in Index* Robert Guiscard
- Guise (*gêz*), French ducal family, branch of house of Lorraine, whose heads led extreme Catholic party and aspired to snatch crown from house of Bourbon.
- Guise, Henry, Duke of (1550-88), "le Balafré" (the Scarred); incited murder of Coligny and Massacre of St. Bartholomew; assassinated by order of Henry III of France Coligny and C-300
- Guise, Mary of. *See in Index* Mary of Guise
- Guise, France, fortified town on Oise River, 90 mi. n.e. of Paris; pop. 7000; taken by Germans 1914 and 1940.
- Guitar (*gi-târ*), a stringed musical instrument G-184, picture M-322
- Guitou (*gê'tô*), Charles (1840-82), American lawyer, assassin of President Garfield G-15
- Guiterman (*gil'êr-mân*), Arthur (1871-1943), American writer, born in Vienna of American parents; brought to New York at age of 2; on editorial staff of *Woman's Home Companion*, *Literary Digest*, etc.; author of historical and legendary ballads and lyrics, and of humorous verse ('Chips of Jade'; 'I Sing the Pioneer'; 'Wildwood Fables'; 'Song and Laughter'); wrote libretto of opera 'The Man Without a Country.'
- Gultry (*gê-trê*), Lucien Germain (1860-1925), French actor, considered the greatest French interpreter of modern realistic drama; his son Sacha (born 1885) also became distinguished as an actor and writer of clever comedies.
- Guizot (*gê-zô*), François (1787-1874), French statesman and historian; head of ministry under Louis Philippe ('History of Civilization in Europe'): L-203
- Gujrat (*gij'rât*), capital of district of Gujrat in n. India; pop. 27,000; British defeated Sikhs in 1849.
- Gulbrandsen, Trygve (born 1894), Norwegian novelist; 'Beyond Sing the Woods' and 'The Wind from the Mountains', beautifully written chronicles of life on a manor in forests of Norway.
- Gulden (*gul'dên*), monetary unit of the former free city of Danzig, equal to a 25th part of an English pound sterling, and nominally worth about 33 cents; also formerly used in Austria and Bavaria (worth when current about 48 and 41 cents respectively); the Dutch gulder is also called gulden.
- Gules (*gûlz*), in heraldry H-281
- Gulf Coastal Plain, lowlands in s. part of U. S. bordering on Gulf of Mexico; originally old sea bottom, by elevation made dry land: U-183, maps N-150a, U-200
- Alabama A-96, 97
- Texas T-56
- Gulf of Mexico. *See* Mexico, Gulf of
- Gulfport, Miss., city on Mississippi Sound 12 mi. w. of Biloxi in truck-farming section; pop. 15,195; deep water harbor; cotton and lumber interests; summer and winter resort; Gulf Park College: map M-200
- Gulfs, how they originated P-198. *See also in Index* gulfs by name
- Gulf Stream, a warm-water current flowing from the Florida Straits across the Atlantic to northern Europe G-185
- cause of G-185, O-200
- fog caused by O-201
- 'Gulf Stream', painting by Winslow Homer, picture P-28
- Gulfweed, a sea-weed with airbladder floats S-72
- Gulick, Luther Halsey (1865-1918), born Honolulu; organized physical education in Y. W. C. A. and in New York City public schools; editor physical education magazines founds Camp Fire Girls C-40
- Gulick, Sidney Lewis (born 1860), American missionary, brother of Luther; spent 27 years in Japan; author of books on the Far East.
- Gull, a long-winged fish-eating bird G-185-7, pictures G-187, color plate B-133
- length of life, average. pictograph A-198
- Gullet, or esophagus, muscular tube from mouth to stomach S-292, P-206
- pouter pigeons P-216
- 'Gulliver's Travels', satire by Jonathan Swift, first published in 1726 S-342, 343-4
- Gullstrand (*gûl'strând*), Allvar (1862-1930), Swedish ophthalmologist and physicist; won Nobel prize in medicine (1911) for work in optics.
- Gull wings, on airplane A-80, picture A-74b
- Gum arabic, soft gum obtained from acacias G-188
- Sudan chief source S-317, E-195
- uses G-188: antidote for phosphorus P-275; candy-making C-72; medieval manuscript ink B-176
- Gumbinnen (*gum-bin'ên*), battle of (August 19-20, 1914) W-155, map W-156
- Gumbo. *See in Index* Okra
- Gum camphor C-41
- Gumdrops C-72
- Gums, substances obtained by drying sap of various plants; distinguished from resins by their solubility in water, but term often applied to resins: G-188
- acacia A-4, G-188
- amber, origin A-140
- arabic G-188
- balsams G-188
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- varnish V-273, G-188, P-32b, diagram P-32a
- Gum trees, pictures T-132, 134, 135
- eucalyptus E-314-15
- Gumwood, wood of various gum trees, much used for furniture G-188
- Gun (weapon). *See in Index* Artillery; Firearms; Machine gun
- Gunboat, U. S. Navy N-56
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- Gun bronze, or gun-metal A-132
- Guncotton, an explosive made by treating cotton with nitric and sulphuric acids E-347-8
- Gunga Din, in Rudyard Kipling's poem, faithful Hindu water-carrier, who dies succoring his master. "Though I've belted you and flayed you . . . you're a better man than I am, Gunga Din!"
- Gun-metal, or gun bronze, a hard bronze A-132, C-176b
- Gun-metal leather L-85
- Gunn, Mrs. Aeneas, Australian novelist A-376
- Gunnarsson, Gunnar (born 1889), Scandinavian novelist, born in Iceland; 'Ships in the Sky' contains warm and tender pictures of a boy's life on an Iceland farm.
- Gun'nison River, in w. Colorado, rises in Rocky Mts. and flows n.w. and joins Colorado River at Grand Junction; waters diverted through Gunnison Tunnel for irrigation purposes: map C-310
- national monument N-20
- Gunnison Tunnel, Colo. T-154
- Gunny, coarse sackcloth jute J-232
- Gunpowder G-188-9
- China, early use in C-221j
- explosive force E-347
- feudalism ended by F-30
- Gunpowder Plot, English conspiracy (1605) F-20
- Gunpowder tea, picture T-22
- Gun salutes, table S-373
- Gunsauls (*gûn-sq'lûs*), Frank Wakeley (1856-1921), Congregational clergyman, born Chesterville, Ohio; pastor Central Church, Chicago; president Armour Institute of Technology, Chicago; noted lecturer.
- Gunter, Edmund (1581-1626), English mathematician; invented "chain" for land measurement.
- Gunter chain, used in surveying S-332
- Gunther, John (born 1901), American journalist, born Chicago, Ill.; represented Chicago *Daily News* in Europe for 12 years; 'Inside Europe', 'Inside Asia', and 'Inside Latin America' are dramatic panoramas of recent events with vivid portraits of leading personages.
- Gunther (*gûn'têr*), in 'Nibelungenlied', king of Burgundians N-140, S-141
- Günz (*gûnts*), a glacial phase I-2b
- Günz-Mindel, interglacial period I-2b
- Guppy, tiny, multi-colored fish (*Lebistes reticulatus*), suitable for household aquariums; native to Caribbean waters: A-234
- Gurkhas (*gôr'kâz*), dominant race of Nepal I-30
- kukri (sword) S-359, picture S-358
- Gur'nard, medium-sized fish with bony-plated head and several detached fin-rays used as feelers; certain types are called "sea robins" from red color: pictures F-69, color plate F-72a-b
- Guru, witch doctor in Sumatra S-325
- Gusher, a spouting oil well P-145, 148, picture P-144
- Gustavus I, Vasa (1496-1560), king of Sweden, founder of Vasa dynasty; made king 1523 by Swedish peasants on expulsion of Danes: S-339
- Swedish flag, origin F-97
- Gustavus II, Adolphus (1594-1632), king of Sweden G-189-90, S-339-40
- Gustavus Adolphus Day H-323
- modern army originated by A-308, G-189
- Gustavus III (1746-92), king of Sweden, 1771-92; by a bloodless revolution, regained regal powers lost by his predecessors; instituted needed reforms, but was assassinated through conspiracy of nobles; wrote excellent historical essays.
- Gustavus IV (1778-1837), king of

û=French u, German ü; gem, gô; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

- Sweden 1792-1809; son of above; his violent hatred for Napoleon led him into coalition against French and into disastrous war with Russia; his subjects, convinced he was insane, dethroned him and denied crown to his descendants; died in poverty in Switzerland.
- Gustavus V** (born 1858), king of Sweden; succeeded father, Oscar II (1907).
- Gustavus Adolphus College**, at St. Peter, Minn.; Lutheran; founded 1862.
- Gutenberg** (*gŭt'en-bêrk*), Johann (1400?-68), German inventor; traditional inventor of printing from movable type: P-346, 347
Frankfort honors F-189
press, picture B-191
- Gutenberg Bible** also called Mazarin, and 42-line Bible B-105, P-346, L-102, picture B-179
- Guthrie, Samuel** (1782-1848), American chemist, born Brimfield, Mass.; first to produce percussion powder successfully; invented punch-lock, process for converting potato starch into sugar; one of three independent inventors of chloroform.
- Guthrie** (*gŭth'ri*), Okla., city 30 mi. n. of Oklahoma City, on Cimarron River; pop. 10,018; in agricultural and oil region; cotton mill, iron foundry, railroad shops; Catholic College of Oklahoma for Women: map O-216
- Guthrum** (*gŭth'rgm*) (died 890), Danish chief, king of East Anglia
Alfred defeats A-118
- Gutiérrez** (*gŭ-tê-yâ'râth*), Antonio García (1813-84), Spanish dramatist of romantic school.
- Gutiérrez** (*gŭ-tê-yâ'râs*), Bernardo (1778-1814), Mexican patriot, born Quanaajuato; led filibustering expedition into Texas with Magee (1812-14).
- Guts Muths** (*gŭts' myts*), Johann Christoph Friedrich (1759-1839), educator, born Quedlinburg, Prussia; founder of German system of school gymnastics.
- Gutta-percha**, gummy substance resembling rubber G-190
- Gutzkow** (*gŭts'kô*), Karl Ferdinand (1811-78), German dramatist and novelist; a leader in "Young Germany" school, revolting against all traditions ('Uriel Acosta'; 'Die Ritter vom Geiste').
- Guy**, origin of "look like a guy" F-20
- Guy's andot River**, rises in southern W. Va. and flows n.w. 150 mi. to Ohio River, map W-76
- Guy Fawkes Day** (November 5) F-20
- 'Guy Mannering'**, novel by Scott S-50
- Guynemer** (*gŭn-mêr'*), Georges (1894-1917), French aviator, perhaps most brilliant "ace" of 1st World War; brought down more than 50 enemy machines before he was killed.
- Guyot** (*gŭ-yô*'), Arnold Henry (1807-84), Swiss-American geographer and geologist; professor of geology Princeton; friend of Louis Agassiz; his meteorological observation led to establishment of U. S. weather bureau ('Earth and Man'; 'Meteorological and Physical Tables').
- Guyot, Mount**, peak of Great Smoky Mts. on N. Carolina-Tennessee border (6621 ft.).
- Gwalior** (*gŭwâ'li-ôr*), citadel and ancient city of cent. India; pop. 22,000 (pop. over 100,000 including nearby Lashkar, cap. of native state of Gwalior); beautiful palace and temples.
- Gwinnett, Button** (1732?-77), signer of Declaration of Independence as Georgia delegate; born England; killed in duel by Gen. Lachlan McIntosh, a political opponent.
- Gwyn, Nell** (1650-87), English actress, favorite of Charles II; her wit, generosity, and kindness endeared her to the English public.
- Gyges** (*gŭ'gêz*), in Greek mythology, hundred-handed giant flung into Tartarus for warring on gods.
- Gyges**, king of Lydia (7th century B.C.), possessor, according to legend, of magic ring that made the wearer invisible; with its aid he killed the reigning king and usurped his throne.
- Gymnasium**, German school G-70
American college compared C-301
Gymnas'tics and gymnasiums P-186, 187. See also in *Index* Athletics
accident prevention S-2f-g
athletics distinguished from gymnastics A-356
home gymnasium, picture C-201
- Gymnospermae** (*gŭm-nô-spêr'mê*), gymnosperms, division of flowering plants consisting chiefly of trees and shrubs whose seeds are not protected by a seed-coat P-244, B-205, T-137
- Győr** (*gŭyŭr*), formerly Raab, Hungary, town at confluence of Raab and Little Danube rivers, 65 mi. w. of Budapest; pop. 50,000; former fortress; machinery, cutlery, oil; farm trade; map A-381
- Gypsophila** (*gŭp-sôf'i-lâ*). See in *Index* Baby's breath
- Gypsum** (*gŭp'sŭm*), a soft mineral, usually white G-190
crystal, picture C-409
relative hardness M-181
uses G-190; cements C-125, 127, 128
varieties G-190, M-183
"white sand" of New Mexico S-23
- Gypsum Cave**, near Las Vegas, Nev.; discovered 1924
antiquities A-148
- Gypsy**, or gipsy G-90-1
Hungarian H-360
music inspires Liszt L-156
- Gypsy moth**. See in *Index* Gipsy moth
- Gyrfalcon** (*gŭr'fŭ-kn*), or gersfalcon H-246
- Gyrocompass** (*gŭrô-kôm-pâs*) G-192, picture G-192
- Gyro-pilot**, automatic steering device G-192, pictures A-77, N-46
- Gyroscope** (*gŭrô-skôp*) G-191-2
precession G-191, E-133-5
rocket controlled by F-62
stabilizers on ships and airplanes G-191-2, A-76, 78, pictures A-77, A-384
torpedo steered by T-114



OUR LETTER H probably started as an Egyptian picture which meant 'a hank of flax' (1). Soon after 2000 B.C., a Semitic people called the Seirites adopted it as an alphabetic sign for a peculiar throaty pronunciation of 'ch'. Probably they did this because to them the sign looked like bandages or a dressing, and their word *chattl* for 'dressing' began with this sound. They made the sign (2) much as the Egyptians did.

Later the Canaanite-Phoenician alphabet gave the sign two different forms (3). In Hebrew the sign was called *cheth*, and other Semitic names were similar. The Greeks learned the sign when the Phoenicians taught them how to write. But since they did not use the peculiar 'ch' sound of *cheth* in their speech, different groups of Greeks used the letter for various related sounds.

The eastern or Ionic Greeks used it for the vowel sound in *cheth*, lengthened into 'ay' as in 'hay'. Thus they got their letter *eta* (4). Certain western Greeks, including the Chalcidians who settled in Italy, preferred to use this sign for the 'h' sound in 'ha'. The Romans adopted the sign with this western meaning in their Latin alphabet. From Latin the capital H came without change into English.

Meanwhile, a small handwritten Greek *eta* (5) had taken shape, with curves, from the Semitic *cheth*. By the 9th century, the corresponding Latin letter, which indicated the sound of 'h', had acquired a shape (6) much like our handwritten and printed small 'h'.

NOTE.—For the story of how alphabetic writing began and developed, see the articles Alphabet; Writing.

Haag, den, Holland. See in Index Hague, The

Haakon (*hå'kôn*) IV (1204-63), "the Old," king of Norway; added Greenland and Iceland to Norwegian realm; invades Scotland T-81

Haakon VII (born 1872), king of Norway; accepted Norwegian crown, 1905, on separation of Norway from Sweden: N-178

Haarlem (*hår'lēm*), Netherlands, cap. of North Holland; attractive city 10 mi. w. of Amsterdam; pop. 120,000; cathedral; large flower industry: N-69, map B-87

Hals' paintings H-203

Haarlem Lake, Holland, former shallow lake, 46,000 acres, now agricultural commune: I-147

Haba, Alois (born 1893), Czech musician and composer; experimented in quarter notes.

Habakkuk (*hå-båk'åk* or *håb'å-kåk*), a Hebrew minor prophet probably of 7th century B.C.; Book of Habakkuk, 8th of the minor prophets, deals with the wickedness of the nation, the rise of the Chaldeans and the appearance of God in judgment.

Habana. See in Index Havana

Habeas corpus (*hå'bē-ås kōr'pūs*), a writ requiring a person in custody to be brought before a court H-193

Merryman case T-8

Haber (*hå'bēr*), Fritz (1868-1934), German chemist; professor Berlin University; specialized in electrochemical investigations; with Carl Bosch invented synthetic process of making ammonia; Nobel prize 1919: N-148

Haber-Bosch process, of nitrogen fixation N-148

Habichtsburg (*hå'bīkts-byrk*), the "Hawk's Castle," seat of Hapsburgs H-212-4

Habit H-193

basis of learning L-81

character education, Outline C-142-3

conditioned reflexes R-64

foundation of character C-140

involuntary action W-98

leisure, worthy use of L-93d

psychology P-360

unlearning bad habits L-82

Habitant (*å-bē-tån'*), name given to French-Canadian peasant D-114

Habit-forming drugs N-12

Habsburg, ruling family. See in Index Hapsburg

Habutai, or habutaye (*hå-bū-tī'*) (Japanese meaning "soft as down"), a silk similar to China silk, but heavier.

Hacienda (*hå-si-ēn'då*), in Latin America name of huge landed estate for farming or stock-raising; name also applied to mining or manufacturing place: S-206d

Chile C-207b

Mexico M-140

Hackamore, a bitless bridle for horses C-113

Hackberry, a tree (*Celtis occidentalis*) of the elm family, ranging over most of the U.S., resembling the elm in aspect, with ovate leaves and rough bark, and bearing small round purple-skinned fruit with sweet yellowish flesh; also called sugarberry and nettle-tree.

Hackbut, early hand-gun F-48

Hackensack, N.J., city 12 mi. n. of Jersey City on Hackensack River; pop. 26,279; airplane accessories, paper board, chemicals.

Hackensack River, in s. New York and n. New Jersey; empties into Newark Bay; about 50 mi. long; navigable for 16 mi.

Hackett, Charles (1887-1942), American operatic tenor, born Worcester, Mass.; debut in 'Mignon', Genoa, Italy, 1915; later with Metropolitan (New York City) and Chicago Civic Opera companies

in 'Romeo and Juliet', picture O-231

Hackett, James Keteltas (1869-1926),

American actor and manager ('The Prisoner of Zenda'; 'The Pride of Jennico'); son of James H. Hackett (1800-71), who was one of the most noted comedians of his day.

Hack'matack, or tamarack, a larch tree L-65, picture L-64

not an evergreen E-340

Hackney, English carriage horse H-343

Hadassah (*hå-dås'å*), the Women's Zionist Organization of America; founded 1912 by Henrietta Szold (born 1860); devoted especially to health work in Palestine; the name is a Hebrew form of Esther.

Haddock, a cod-like fish H-194, F-74

Haddonfield, N. J., borough, residential suburb, about 5 mi. s.e. of Camden; pop. 9742.

Had'don Hall, famous old mansion in Derbyshire, England, 30 mi. s.e. of Manchester; a show place today; associated with Dorothy Vernon: picture A-269

Ha'den, Sir Francis Seymour (1818-1910), English etcher and surgeon; in addition to distinguished career as surgeon, became foremost English etcher, causing revival of etching in England; brother-in-law of Whistler.

Hader, Elmer Stanley (born 1889), artist and writer, born Pajaro, Calif.; painted landscapes and portraits; collaborated with his wife, Berta Hoerner Hader, in writing and illustrating children's books ('Spunky'; 'Midget and Bridget'; 'Whiffy McMann'; 'Billy Butter').

Hades (*hå'dēz*), in Greek mythology, god of underworld, or the underworld itself H-194, P-260, U-261

Aesculapius and H-370

Demeter and Persephone D-44-5

Hercules visits H-282

Orpheus and Eurydice O-252

Hadfield, Sir Robert Abbott (1858-1940), English metallurgist, born Sheffield; discovered manganese and silicon steel in 1883 ('Metal-

ü=French u, German ü; gem, jo; thin, then; ã=French nasal (Jean); zh=French j (z in azure); x=German guttural ch

- lurgy and Its Influence on Modern Progress'; Faraday and His Metallurgical Researches).
- Hadhramaut** (*hā-drā-mout'*, Arabic *hā-drā-mā-ūt'*), a region of s. Arabia; boundaries undefined: A-233, maps A-242, A-332b-c
- Hadji, Hajji, or Hodji**, title gained by pilgrim to Mecca M-103
- Hadley, Arthur Twining** (1856-1930), American educator and political economist, born New Haven, Conn., associated with Yale University throughout most of his life as student, teacher, and as president 1899-1921; authority on railroad administration ('Railway Transportation: Its History and Its Laws'; 'The Education of the American Citizen'; 'The Conflict between Liberty and Equality').
- Hadley, Henry K.** (1871-1937), American composer, born Somerville, Mass.; conducted orchestras of Seattle and San Francisco; associate conductor New York Philharmonic Orchestra; conductor Manhattan Orchestra; composed operas ('Cleopatra's Night'); symphonies ('The Four Seasons'); cantatas; songs.
- Hadley, Herbert S.** (1872-1927), American lawyer and educator, born Olathe, Kan.; first Republican governor Missouri 1909-13; led fight for Roosevelt's nomination in 1912 Republican convention; became president Washington University, St. Louis, 1923.
- Hadley, John** (1682-1744), English mathematician and physicist; invented sextant; improved reflecting telescope: N-46
- Hadley chest**, in American Colonial times A-169
- Hadrian** (*hā-dri-ān*), or **Adrian**, popes. See in *Index* Popes, table
- Hadrian, Publius Aelius** (76-138), Roman emperor, born in Spain; Adrianople named for: R-136, L-69, S-229
- builds wall in Britain E-270, 280 bust, picture R-131
- Pantheon erected by, picture A-260 rebuilds Jerusalem J-212
- ruins of villa, picture I-171
- tomb, Castle Sant' Angelo, Rome R-145, picture R-139
- Hadrian's Wall**, Roman fortification across n. England between the Tyne and Solway Firth E-280, R-136
- Haeckel** (*hēk'ēl*), **Ernst Heinrich** (1834-1919), German biologist; advocated Darwinian views; aroused controversy by anti-theological attitude ('Natural History of Creation'; 'The Riddle of the Universe').
- Haemon** (*hē'mōn*) in Greek mythology, son of Creon, legendary king of Thebes O-208
- Hafiz** (*hā'fiz*), pen name of Shams-ed-Din Mohammed (died 1388?), Persian lyric poet and philosopher; tomb near Shiraz a place of pilgrimage.
- Hafnium**, a chemical element C-176, table C-168
- Ha'gar**, Sarah's handmaid, mother of Abraham's son Ishmael (Gen. xvi, xxi).
- Hag'edorn, Hermann.** (born 1882) American author, born New York City; wrote poems, pageants, and plays; biographer of Theodore Roosevelt ('Boys' Life of Theodore Roosevelt'; 'Roosevelt in the Bad Lands'; 'The Rough Riders'); also wrote biographies of Leonard Wood, Edwin Arlington Robinson, and others.)
- Hageman** (*hā'gē-mān*), **Richard** (born 1882), American composer and conductor, born Holland; a conductor of Metropolitan (New York City), Chicago, and Los Angeles opera companies; composed many songs ('Do No Go, My Love') and opera ('Caponsacchi').
- Hagen** (*hā'gēn*), Germany, industrial city in Westphalia, Prussia, on Volme River about 31 mi. n.e. of Düsseldorf; pop. 150,000; important iron and steel works; metal goods, leather, sugar, paper.
- Hagen, in 'Nibelungenlied'**, slayer of Siegfried S-141, N-140
- Hagenbeck** (*hā'gēn-bēk*), **Carl** (1844-1913), German animal dealer and showman Z-224, 226, E-249
- Hagenbeck Tierpark**, zoo in Germany Z-224, H-204, pictures Z-221, 226
- Ha'gerstown, Md.**, manufacturing city in center of rich farm section, 64 mi. n.w. of Baltimore; pop. 32,491; shoes, hosiery, airplanes, organs, cement; airport; battlefields of Antietam and Gettysburg near by: map M-78
- John Brown at B-250
- Hagfish, or borer**, an eel-like parasitic fish P-70
- Haggai** (*hā'gā-ī*), the 37th book of the Old Testament and 10th of the minor prophets. Haggai prophesied about 520 B.C.; appealed to his countrymen to restore the temple.
- Hag'gard, Sir Henry Rider** (1856-1925), English novelist and writer on land economics; spent early life in S. Africa, scene of many of his best novels, including 'She', 'King Solomon's Mines', 'Allan Quatermain', and 'Ayesha, or the Return of She', fantastic stories which show a fertile imagination.
- Haggard hawk, or blue hawk**, a falcon F-7
- Hagiographa** (*hā-gī-ōg'ra-fā*), or 'Holy Writings,' portion of the Old Testament P-353
- Hague** (*hāg*), The (Dutch, 's Gravenhage, also den Haag), governmental center of the Netherlands; pop. 435,000: H-194, map B-87
- Hague Gallery, table M-392
- Permanent Court of International Justice (the "World Court") L-78
- Hague Peace Conferences** H-195
- armament limitation fails P-92
- Peace Day H-320
- Peace Palace, gift of Carnegie C-86, picture H-194
- poison gas banned G-24
- U. S. represented: Harrison, Benjamin H-231
- Hague Tribunal.** See in *Index* Permanent Court of Arbitration
- Hahn** (*hān*), **Otto** (born 1879), German chemist, discoverer of protactinium (1917).
- Hähnel** (*hā'nēl*), **Ernst** (1811-91), German sculptor S-61
- Hahnemann** (*hā'nē-mān*), **Samuel C. F.** (1755-1843), German physician, founder of homeopathy.
- Haida** (*hī'dā*), or **Kaigani**, the Indians of Queen Charlotte Islands, British Columbia, and of the s. end of Prince of Wales Island, Alaska, forming the Skittagetan stock. Their houses and canoes were noteworthy: I-56
- Old Kasaan monument N-226
- totem pole, picture F-9
- Haifa** (*hī'fā*), Palestine, seaport 70 mi. n. of Jerusalem at foot of Mt. Carmel; railway terminus; trade center; fine new harbor; pop. 110,000: map A-242
- Haig** (*hāg*), **Douglas Haig**, first Earl (1861-1928), British soldier H-195
- battle of the Somme S-193
- Haight, Caniff** (1825-1901), Canadian author, born Adolphustown, Upper Canada ('Country Life in Canada'; 'Here and There in the Home Land').
- Hai Ho** (*hī hō*), river of China, formed just above Tientsin by the confluence of the Pei Ho and three other rivers.
- Hail, town in Nejd**, kingdom of Saudi Arabia, 250 mi. n.e. of Medina; pop. 20,000: map A-242
- Hail, in meteorology** H-195
- Hailar** (*hī'lār*), Manchukuo, capital of North Hsingan province, n.w. Manchukuo; about 100 mi. e. of Manchouli on North Manchuria railroad; pop. 35,000; horse and cattle markets: map M-49a
- 'Hail Columbia', patriotic song of U.S. N-24
- Haile Selassie I** (*hī'lē sē-lā'sē*) (Ras Teferi Makonnen) (born 1893), emperor of Ethiopia; educated at a French mission, he became widely read and familiar with European politics and history; made regent October 1928, sharing throne with his aunt, Empress Zauditu, until her death (1930), when he became sole ruler: E-307-8, picture E-307
- loses throne to Italy E-309
- regains throne E-309
- Hainan** (*hī-nān*), island 15 mi. from coast of China, in South China Sea; seized by Japan 1939; 13,500 sq. mi.; pop. 2,500,000; jungle-covered mountains; rich valleys; sugar cane, cotton: map C-211
- Hainaut, or Hainault** (*ē-nō*), Belgian province; scene of many battles during 1st World War; important in coal and iron mining, and iron and steel works; cap. Mons; 1437 sq. mi.; pop. 1,270,000.
- Hainisch** (*hī'nish*), **Michael** (1856-1940) president of Austrian Republic 1920-28; noted Socialist writer; previously (1909) member of Austrian parliament; favored Germany's annexation of Austria.
- Haiphong** (*hī-fōng*), commercial center and port of Tonkin protectorate, French Indo-China, in Songkoi (Red) River delta about 60 mi. e. of Hanoi; pop. 70,000; one of chief shipping points for coffee, tea, silk: I-73c, maps I-73b, A-332c
- Hair, animal** H-195-6
- alpaca and vicuña A-134
- camel C-38, 39, picture H-196
- characteristic of mammals M-44
- economic uses H-196, M-97: cloth T-69, H-196, C-274, 275; felt C-275, T-69, F-23
- goat (mohair) G-108
- horn related to H-338
- horse, picture H-196
- removed by barium hydroxide A-128
- spider, picture S-255
- Hair, human** H-195-6
- care of H-376
- color H-196
- fashions in arrangement D-107-9: Japan, picture J-189, color plate J-196a; Malay, picture M-42
- "gray-hair vitamin" V-311a
- growth and length H-196
- in race classification H-196, R-10
- removed by barium sulphide A-128
- sulphur in S-323
- Hairecloth**, a stiff, wiry fabric made with cotton, linen, or worsted warp, and filling of horsehair; formerly much used in upholstery.
- Hair-line micrometer**, in telescopes and microscopes M-155
- Hair seal** S-70

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, ryde, fūll, bārn;

- Hair-spring**, of timepieces W-39, 40
Hairworms W-180b
Hairy-armed bat, picture B-64
Hairy rhinoceros, or woolly rhinoceros, extinct species, common in Europe in Ice Age R-94, picture C-119
Haiti (*hā'ti*), Negro republic in West Indies; 10,200 sq. mi.; pop. about 3,000,000; cap. Port au Prince: H-197-8, maps W-72b, N-150c
Columbus H-198, C-319, C-102-3
Las Casas' work for Indians L-67
literature L-67v
Santo Domingo and S-27
slavery introduced S-161, H-198
Hajji (*hāj'jī*), or **Hadji**, title gained by pilgrim to Mecca M-103
Hake, a large marine fish closely related to the cod, but not popular as food; one species (*Merluccius bilinearis*) is abundant on the New England coast and is caught in the same manner as the cod; usually eaten fresh, occasionally smoked.
Hakluyt (*hāk'lūt*), Richard (1553-1616), English geographer ('Voyages and Discoveries of the English Nation', called the "prose epic of the modern English nation").
Hakodate (*hā-kō-dā'tō*), Japan, fortified seaport on rocky promontory in s. Hokkaido; pop. 205,000; exports fish products, charcoal, sulphur, timber: map J-186
Halcyon (*hāl'si-on*), or **Alcyon**, in Greek mythology K-21
Halcyon, ancient name for kingfisher, a fish-eating bird K-21, B-131, color plate B-137
"Halcyon days" K-21
Hald, Edward, Swedish designer of ornamental glass carved bowl, picture G-104
Hal'dane, John Scott (1860-1936), British scientist; born Edinburgh; director, Mining Research Laboratory, Birmingham University; Gifford lecturer, Glasgow University; in charge of government inquiries on ventilation, respiration and cause of mine explosions ('The New Physiology'; 'The Sciences and Philosophy'); father of J. B. S. Haldane (born 1892), professor of genetics at London University ('Possible Worlds'), and of Naomi Mitchison (born 1897) novelist ('Anna Comnena').
Haldane of Cloan, Richard Burdon
Haldane, first Viscount (1856-1928), British statesman and philosopher, born in Scotland; wrote 'Life of Adam Smith', 'The Pathway to Reality', 'The Reign of Relativity', and 'The Philosophy of Humanism'; profound student of German philosophy, tried to avert 1st World War but failed; sat in House of Commons 1885-1911; as secretary for war 1905-12, reorganized British army; lord chancellor 1912-15 and 1924.
Halden, Norway, formerly Fredrikshald, fortified seaport on Idde Fiord; pop. 11,000; timber trade; Charles XII of Sweden was killed here during siege in 1718.
Hal'dimand, Sir Frederick (1718-1791), British general and administrator, born Switzerland; fought valiantly during French and Indian wars; governor of Canada 1778-84; sternly held down French sympathizers with American Revolution.
Hale, Adam de la. See in Index Adam de la Halle
Hale, Edward Everett (1822-1909), American preacher, author of 'The Man without a Country' H-199
Hale, George Ellery (1868-1965), American astronomer, born Chicago; made special study spectroscopy; invented spectroheliograph; organizer and director of Yerkes Observatory, later of Mount Wilson observatory
sunspot theory S-329
Hale, John Parker (1806-78), American orator and statesman, long member of House of Representatives and for 16 years of Senate; anti-slavery advocate; nominated for president by Free-Soil Democrats in 1852; consistently supported Lincoln throughout Civil War.
Hale, Nathan (1755-78), American Revolutionary soldier and patriot H-199-200
Hale, Sarah Josepha (1788-1879), American editor and author; born Newport, N. H.; editor Boston *Ladies' Magazine* and *Godley's Lady's Book*; said to have suggested Thanksgiving Day as national holiday and to have campaigned for it from 1846 onward; 'Mary Had a Little Lamb' credited to her ('Northwood'; 'Sketches of American Character').
Haleakala (*hā-lā-ā-kā-lā*), volcano on Hawaiian Island of Maui N-22a
Ha'leb, Syria. See in Index Aleppo
Halévy (*d-lā-vē*), J. F. F. (1799-1862), French (Jewish) composer ('La Juive' and 'L'Edair', operas). 'La Juive', story O-230
Halévy, Ludovic (1834-1908), French dramatist and novelist; for over 20 years collaborated with H. Meilhac on operettas, farces, and comedies chiefly about Parisian life ('La Belle Helène', 'La Grande Duchesse', 'Barbe Bleue'); also wrote 'L'Abbé Constantin', sweetly sentimental, popular tale, classic for French instruction.
"Half-breeds", Republicans who opposed nomination of Grant for 3d term (1880) G-15
Half moon, a lunar phase M-250
'Half Moon', Hudson's ship H-848
Half-nelson, in wrestling W-182
Half-title, of a book B-181
Half-tone, an engraving, how made E-298, pictures E-297, 298
Half-uncial writing B-177
Hal'iburton, Thomas Chandler (1793-1865), Canadian humorist; pen name "Sam Slick"; lawyer and judge in Nova Scotia; retired to England (1856): C-65
Halibut, a large flatfish H-200, F-103-5, F-74
Halicarnassus (*hāl-i-kār-nās'ūs*), ancient Greek city in Caria, Asia Minor
birthplace of Herodotus H-287
mausoleum S-82, pictures G-167, S-83
Halidah Adib, or **Halidé Edib**. See in Index Edib, Halidé
Hal'idon Hill, height n.w. of Berwick-upon-Tweed, England, where English under Edward III defeated the Scots (1333).
Hal'ifax, Charles Montague, Earl of (1661-1715), English statesman; introduced into Great Britain national debt instead of annual taxation to meet expenses of war; carried out recoinage (1695); patron of Newton, whom he appointed warden of mint.
Halifax, Edward Frederick Lindley Wood, Viscount (born 1881), British statesman, born Yorkshire; entered Parliament 1910 as Conservative; 1924-25 minister of agriculture; 1926-32 viceroy of India; 1935 secretary of war; 1935-38 leader of House of Lords; 1938-40 foreign secretary; 1940 appointed ambassador to U.S.
Halifax, England, manufacturing city in s. 12 mi. s.w. of Leeds; pop. 84,000; textiles, iron products, chemicals, coal-mining, quarrying; woolen mills: map E-278a
Halifax, important port and capital of Nova Scotia, Canada; pop. 54,275: H-200-1, map C-53c
codfish, drying, picture C-55
Hal'ite, sodium chloride in mineral form M-158
Hal'tver oil, source H-203
Hall, Asaph (1829-1907), an American astronomer; professor at Harvard University; discovered 2 moons of planet Mars.
Hall, Charles Francis (1821-71), American explorer, born Rochester, N. H.; searched for Franklin party from 1860 to 1869; died on expedition to North Pole in 1871.
Hall, Charles Martin (1863-1914), American inventor H-231, A-168
Hall, Esther (born 1904), author of books for girls, born Greeley, Colo.; journalist and teacher; her experiences are background for her books ('Up Creek and Down Creek'; 'College on Horseback'; 'Haverhill Herald').
Hall, G. Stanley (1846-1924), American educator and psychologist, president of Clark University; born Ashfield, Mass.; adapted teaching methods to facts of psychology.
Hall, James Norman (born 1887), American writer, born Colfax, Iowa, lived many years in Tahiti author of 'Doctor Dogbody's Leg'; with C. B. Nordhoff wrote 'Mutiny on the Bounty', 'Men Against the Sea', 'Pikrain's Island'; 'The Hurricane'; 'The Dark River'.
Hall, John H., inventor of breech-loading rifle F-50
Hall, Lyman (1724-90), signer of Declaration of Independence; governor of Georgia (1783-85).
Hall'am, Henry (1777-1859), English historian ('Europe During the Middle Ages'; 'Constitutional History of England'); father of Arthur Henry Hallam (1811-33), subject of Tennyson's 'In Memoriam'.
Halle, Adam de la. See in Index Adam de la Halle
Hallé (*hāl'ē*), Sir Charles (1819-1895), German-English pianist and conductor, born Hagen, Westphalia; exercised important influence in musical education of England; married Mme. Norman Neruda, noted violinist.
Halle (*hāl'ā*), Germany, city 20 mi. n.w. of Leipzig on the Saale River; pop. 195,000; large salt works; noted for university founded in 1694 by Frederick III, elector of Brandenburg: map G-66
Hal'leck, Fitz-Greene (1790-1867), American poet, born Guilford, Conn.; remembered for two poems, 'Marco Bozzaris', and 'On the Death of Joseph Rodman Drake'.
Halleck, Henry Wager (1815-72), American Civil War general, born Westernville, N. Y.; succeeded McClellan in July 1862 as general-in-chief of all Union armies; superseded March 1864 by Grant: C-253
Hallelujah (*hāl-ē-lū'yā*), a Hebrew word meaning "praise ye the Lord."
Hal'ley, Edmund (1656-1742), English astronomer; predicted return of "Halley's comet": C-320
Newton and N-112

ü=French u, German ü; gem, gō; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

Halley's comet C-320
Halliburton, Richard (1900-39), writer, lecturer, and traveler, born Brownsville, Tenn.; wrote in youthful, vigorous style; lost in attempt to sail a Chinese junk across Pacific Ocean ('Royal Road to Romance', 'Glorious Adventure').
Hall-mark, official stamp used by goldsmiths and silversmiths to indicate purity; originally used on gold and silver articles in Goldsmiths' Hall in London; used figuratively of persons or things showing signs of genuineness.
Hall of Columns, at Karnak E-208, pictures E-209, color plate A-260a-b
Hall of Fame H-201-2, picture N-132
Hall of the Abencerrages (*û-bân-thârûthâs*), Alhambra A-127
Hall of the Ambassadors, Alhambra A-127
Hall of the Winds, Jaipur, India, picture I-28
Hallowe'en (*hâl-ô-ên'*), the evening of October 31 H-202
Hallstatt (*hâl'shtât*), town in Ostmark on Lake Hallstatt; old and famous salt mines; ancient Celtic remains of Iron and Bronze Ages, dating back 3000 years or more.
Hallström (*hâl'strûm*), Per August Leonard (born 1866), Swedish novelist; chairman of committee of Swedish Academy for Nobel awards ('Stray Birds'; 'An Old Tale').
Hallucination, imaginary perception where no actual object exists, as in delirium.
Hallwachs (*hâl'vâks*), Wilhelm (1859-1922), German physicist, lecturer at Leipzig and Strassburg, professor of physics at Dresden technical institute and at Giessen; in 1888 discovered underlying principle, known as the Hallwachs effect, of the photoelectric cell: P-177
Halo (*hâl'ô*), in astronomy, luminous bands around the sun or moon caused by refraction and reflection of rays of light by the ice crystals in the atmosphere; in art, circle of light surrounding a head to denote divinity or saintliness.
Halogens (*hâl'ô-jênz*), the four related chemical elements fluorine, chlorine, bromine, and iodine C-223
Halophytes, plants which live in salt water environment.
Halper, Albert (born 1904), writer, born Chicago; began writing in 1928; wrote his first novel 'Union Square' (1933) while living in poverty ('The Foundry'; 'The Chute').
Hals (*hâls*), Frans (1580?-1666), Dutch painter H-202-3
Halsey, William Frederick, Jr. (born 1882), U. S. naval officer, born Elizabeth, N.J.; led successful attacks on Gilbert and Marshall, Wake, and Marcus isls. Feb. 1942; made commander of naval forces in s. Pacific Oct. 1942, in direct command of Solomon Islands campaign after Oct. 1942.
Hälsingborg (*hêl'sing-bôr*), also Helsingborg, seaport of Sweden; pop. 59,000; in s. opposite Helsingör, Denmark; had important part in Scandinavian wars.
Halter hieh, or halter tie K-35, pictures K-35, 36
Halys (*hâl'is*) River. See in Index Kizil-Irmak River
Ham, son of Noah; traditional ancestor of Hamites (Gen. vi, ix).
Ham, pork product
 food value compared with milk, picture M-172
 smoking and curing H-316

Ham, East and West. See in Index East Ham; West Ham
Hama (*hâ'mâ*), Biblical Hamath, Syria, city on Orontes River, 115 mi. n.e. of Damascus; remains of ancient Hittites; now important trading center; pop. 40,000.
Hamadan (*hâm-mâ-dôn'*), ancient Ecbatana, manufacturing city, cap. of Hamadan province, in w. Persia; pop. 100,000; felt and leather: P-130, map A-332b
Hamadryad (*hâm'â-âri-âd*), or "king cobra" C-291
Hamadryad baboon M-230
Hamadryad, or dryad, wood nymph in Greek mythology N-188
Hamaguchi (*hâm-mû'gû-chi*), Yuko (1870-1931), Japanese statesman; became premier 1929; called "Warrior for Peace" for support of London Naval Treaty, 1930; assassinated.
Hamamelidaceae (*hâm-â-mê-li-dâ-sê-ê*). See Witch-hazel family
Hamam (*hâm'mân*), chief minister of Persian king Ahasuerus outwitted by Esther E-305
Ham'burg, a state and a city of Germany, on Elbe River; pop. 1,685,000: H-203-4, maps G-66, E-326d
 air raids W-179c
 Hagenbeck Tierpark (zoo) Z-224, H-204, pictures Z-221, 226
 harbor improvements H-203, H-216
 member Hanseatic League H-212
 trade in wild animals Z-220
 waterfront, pictures H-203, G-67
Hamburg-American Line, a German transatlantic steamship company operating between Europe and America; founded at Hamburg, 1847; American interests merged with North German Lloyd in 1934.
Hameln (*hâm'mêln*), also Hamelin, town in n.w. Germany, 25 mi. s.w. of Hanover; famed as scene of legend of the Pied Piper.
Ham'erton, Philip Gilbert (1834-94), English writer, painter, and art critic ('The Intellectual Life').
Hamilear (*hâm-mîl'kâr*) Barca (270?-228 B.C.), Carthaginian general, father of Hannibal and Hasdrubal H-211
 Barcelona founded by B-46
Ham'ilton, Alexander (1757-1804), American statesman, first secretary of treasury H-204-5
 John Adams and A-13
 Bank of the United States B-44
 birthday celebrated H-320
 duel with Burr H-205, B-281
 Jefferson opposed by J-208, H-205
 Marshall supports M-71
 Paterson, N. J., founded by P-88
 plan of new Constitution U-207, 208
 secretary of the treasury W-18, H-205
 tariff T-13b
 works for stronger union U-206, 207
Hamilton, Cosmo (1872-1942), English novelist and dramatist, brother of Arthur Hamilton Gibbs and Sir Philip Gibbs ('The Blindness of Virtue'; 'A Sense of Humour'; 'The Three Passions').
Hamilton, Edwin T. (born 1898), American author H-313
Hamilton, Emma, Lady (1765?-1815), wife of Sir William Hamilton (1730-1803), British envoy at Naples; active in social and political life of Naples, an intimate of Queen Maria Carolina; friend of Admiral Nelson; model for many famous paintings by Romney.
Hamilton, Henry (died 1796), British soldier, governor of Detroit during Revolutionary War; incited Indian raids along frontier; in later life

was governor of Canada and of Bermuda
 surrender at Vincennes C-259
Hamilton, Sir Ian (born 1853), British general; joined the army in 1872 and served until 1919; distinguished himself in South Africa and India; commanded Dardanelles expedition in 1st World War ('Galipoli Diary'; 'Friends of England'; 'Soul and Body of an Army').
Hamilton, John William (1845-1934), American Methodist Episcopal bishop, born Weston, Va.; founded People's Church, Boston, 1875; editor, *Christian Educator* 1892-1900; chancellor American University, Washington, D.C.
Hamilton, Sir William (1788-1856), Scottish philosopher; as professor of logic and metaphysics at Edinburgh, stimulated his students to belief in importance of psychology.
Hamilton, Sir William Rowan (1805-1865), British mathematician, born Ireland; developed "quaternions," a form of calculus.
Hamilton, Bermuda, cap. and chief port of Bermuda Islands; on island of Bermuda; pop. 3000.
Hamilton, N.Y., village 25 mi. s.w. of Utica; pop. 1790; Colgate University.
Hamilton, Ohio, city on Great Miami River, 20 mi. n. of Cincinnati; pop. 50,592; Diesel engines, woolen goods, stoves, safes, coated paper, automobile parts; named for Alexander Hamilton: map O-210
 home of William D. Howells H-347
Hamilton, Ontario, Canada, manufacturing center and port; pop. 155,547: H-205, map C-50c
Hamilton, Mount, Calif., peak of the Coast Range, 25 mi. e. of San José Lick observatory O-194
Hamilton College, at Clinton, N. Y.; men; founded 1793 as academy, chartered as college 1812; arts, sciences, classics.
Hamilton Inlet, indentation of Labrador coast, outlet of Hamilton River potential water power L-46
Hamilton River, or Grand River, chief river of Labrador; flows e. 600 mi. into Melville Lake, extension of Hamilton Inlet on Atlantic coast: map C-50c
 Grand Falls L-46
Hamites (*hâm'its*), a native race of North Africa A-39
 in Ethiopia E-308
Hamitic languages P-171
'Hamlet', Shakespeare's greatest tragedy, based on story first told by Danish chronicler, Saxo Grammaticus H-205-6, S-100f
 chronology and rank S-100c
 Elsinore, Hamlet's home C-356
Ham'lin, Hannibal (1809-91), American anti-slavery statesman, born Paris Hill, Me.; vice-president 1861-65; intimate friend and advisor of Lincoln.
Hamline University, at St. Paul, Minn.; Methodist; founded 1854 at Red Wing, Minn.; reopened 1880 at Hamline (between Minneapolis and St. Paul); liberal arts.
Hamm (*hâm*), Germany, city in Westphalia, at junction of Ahse and Lippe rivers; pop. over 50,000; railroad and trucking center of the Ruhr district; coal, iron, machinery; thermal baths; town founded 1226; joined Hanseatic League 1417.
Hammaraskjöld (*hâm'âr-skûld*), Hjalmar (born 1862), Swedish statesman; prime minister 1914-17:

Key—câpe, ât, fâr, fâst, what, fâll; mē, yēt, fêrn, thêre; ice, bît; rôw, wôn, fôr, nôt, dg; cûre, bût, rûde, fûll, bûrn:

- member various international arbitration courts.
- Hammer**, or malleus, bone of ear E-126, *diagram* E-127
- Hammer**, a tool T-108, 110, *pictograph* T-110a
pneumatic P-265, T-110
steam I-144
- Hammerfest** (*häm'ër-fëst*), Norway, port on Kvalø Island on Arctic Ocean; pop. 3700; northernmost town in Europe: N-176, *map* N-173, *picture* N-178
- Hammer-head shark** S-103
- Hammer-lock hold**, in wrestling W-183
- Hammer-smith**, England, western borough of London; pop. 136,000; boat-building and other manufactures; home of William Morris.
- Hammerstein** (*häm'ër-stün*), Oscar (1847-1919), American opera and theater director, born Germany; manager Manhattan Opera House, N.Y.; foremost in establishing French opera in America.
- Hammond**, John Hays (1855-1936), American mining engineer, born San Francisco; associated with Cecil Rhodes in South Africa; sentenced to death after Jameson raid, but was released by Boers upon payment of a \$125,000 fine; after 1900 active in U. S. and Mexican mining development and in hydroelectric and irrigation projects.
- Hammond**, John Hays, Jr. (born 1888), American inventor, son of the above, born San Francisco; inventor of many devices relating to radio, including wirelessly controlled torpedoes, radio system for controlling ships, a system of selective radio telegraphy.
- Hammond**, Laurens (born 1895), inventor of Hammond electric organ; born Evanston, Ill.; also invented novachord and electric card-shuffling bridge table; president of Hammond Instrument Co.: O-250
- Hammond**, Ind., manufacturing and railroad city on Lake Michigan, adjoining Chicago; pop. 70,184; steel products, locomotives and cars, corn products, chemicals, soap, petroleum products: *map* I-46
- Hammond typewriter** T-175
- Hammurabi** (*hä-mu-rä'bë*) (about 2100 B.C.), king of Babylonia; organizer of empire and codifier of laws: B-6
prohibition laws P-350
- Hamp'den**, John (1594-1643), English Puritan patriot and statesman H-206
- Hampden**, Walter (born 1879), American actor, born Brooklyn, N. Y.; début in England 1901 with classical repertoire company; distinguished in 'Hamlet', other Shakespearean plays, 'The Servant in the House' and 'Cyrano de Bergerac'.
- Hampden-Sydney College**, Presbyterian college for men at Hampden-Sydney, Va.; founded 1776; liberal arts.
- Hampshire**, or Southampton, county of England on s. coast; 1458 sq. mi., including Isle of Wight; pop. 472,000; ports Southampton, Portsmouth: E-280
chalk deposits, *picture* M-183
- Hampshire**, breed of hog H-316
- Hampshire**, breed of sheep S-106
- Hampstead**, England, metropolitan borough in n.w. of London; pop. 89,000; formerly noted for mineral springs; residence of first earl of Chatham, John Constable, George Romney, Sir Richard Steele, John Keats, Leigh Hunt.
- Hampstead Heath**, open space of 240 acres in north of London preserved to great extent in natural state.
- Hampton**, Wade (1818-1902), American (Confederate) general and statesman, born Columbia, S.C.; raised and equipped "Hampton's legion"; U.S. senator 1878-91; U.S. commissioner of Pacific railroads 1893-97
elected governor of S.C., *picture* C-257
- Hampton**, Va., port on Hampton Roads, oldest continuous English community in America; pop. 5898. Settled 1610, was first known as Elizabeth City; given present name in 1680 in honor of 3d Earl of Southampton. Scene of first free school in American colonies. Provided haven for exiled Acadians 1755. City attacked by British in War of 1812 and partly burned; burned by Confederates in Civil War. Incorporated as town 1849, chartered as city 1908. Hampton Institute (for Negroes) and state school for colored deaf and blind children. Near by are Langley Field, U. S. Army air base, and Fort Monroe, U. S. Coast Artillery post: N-149, *map* V-306
- Hampton Court**, England, palace on Thames River 10 mi. s.w. of London, *picture* E-272
- Hampton Institute**, at Hampton, Va.; founded 1868; for Negroes; agriculture, business, education, home economics, nursing: N-62
Booker T. Washington at W-12
- Hampton Roads**, channel between James River estuary and Chesapeake Bay, Va., *map* C-253
Civil War: battle of Monitor and Merrimack M-224-5; peace conference S-285
naval operating base N-149
- Hampton Roads**, Port of N-149
- Hamster**, a burrowing rat, possessing large cheek pouches feeds chiefly on grain, roots, and fruits: R-51
- Ham'sun**, Knut (born 1859), Norwegian novelist; early life burdened by hardships; came to America and worked as farm hand, street-car conductor, fisherman, etc.; returned to Norway and after 1889 devoted time chiefly to writing, producing powerful realistic novels; awarded Nobel prize in literature 1920 ('Growth of the Soil'; 'Hunger'; 'Pan'; 'Chapter the Last'; 'Vagabonds'; 'Look Back on Happiness').
- Hamtramck** (*häm-träm'ik*), Mich., manufacturing city adjoining Detroit; pop. 49,839 (3559 in 1910); wheels, iron and aluminum castings, automobile accessories
population increase D-58
- Han**, "the river," in Korea (Chosen), rises 30 mi. from e. coast, cuts Korea nearly in half, and flows into Yellow Sea; navigable for 150 mi.
- Hanau** (*hä'nou*), Germany, industrial city on Main River 10 mi. e. of Frankfurt; pop. 39,000; machinery, jewelry, silver, gold, and platinum articles; Napoleon defeated Bavarians in 1813.
- Hancock**, John (1737-93), American patriot, first governor of Massachusetts H-206-7
burial place B-200
Gage attempts to arrest L-100
house in Quincy, *picture* A-163
president of Continental Congress, *picture* R-81
signature reproduced D-30
- Hancock**, Winfield Scott (1824-86), Union general in Civil War H-207
- Hancock**, Mich., copper-shipping port opposite Houghton on Lake Portage, connected with Lake Superior by canal; pop. 5554; foundries, woodworking plants, creameries, smelters; Suomi College and Theological Seminary: *map* M-153
- Hand**, in anatomy H-207-8, *pictures* H-208
bones of S-156
manipulative reflexes R-63-4
man's and ape's compared, *picture* A-225
monkey M-226-7
right- and left-handedness C-199
whale flippers W-77, *picture* H-208
- Hand**, a unit of measurement equal to four inches (the supposed width of a palm), commonly used as a measure of the height of horses.
- Handball**, a fast game of ancient Irish origin H-208-9
- Han'del**, George Frederick (1685-1759), German-English composer, master of the oratorio H-209-10
music analyzed M-312
'The Child Handel', *picture* P-211
- Handel and Haydn Society** M-316
- Handforth**, Thomas (born 1897), etcher, lithographer, and portrait painter, born Tacoma, Wash.; studied art in Paris and the Far East; prepared children's picture books: 'Mei Li', Caldecott Medal (1939); 'Faraway Meadow'.
- Handicraft**, any craft requiring the skilled use of hand tools, *Outline* I-78
bibliography H-313k, I-78
- Hand organ** or barrel organ, musical instrument with revolving barrel or cylinder; used by itinerant musicians; celebrated in poem, 'The Barrel-Organ', by Alfred Noyes.
- Handshake**, origin E-310
- Hand-to-hand**, at close quarters; side by side; "hand-to-hand conflict."
- Handwriting** H-210. *See also in Index* Writing
- Handy**, William Christopher (born 1873), Negro composer, born Florence, Ala.; wrote some of the first "blues" music which influenced the later "jazz" and "swing" ('Memphis Blues'; 'St. Louis Blues'; 'Beale Street Blues').
- Han** (*hän*) Dynasty (206 B.C.-220 A.D.), China C-221-i
pottery C-221h, *picture* P-333, *color plate* facing C-221i
- Hangar** (*häng'gär* or *häng'ër*), a structure for the storage and repair of aircraft.
- Hang'chow**, China, 100 mi. s.w. of Shanghai at mouth of the Tsientang River and at s. end of Grand Canal; cap. of Chekiang province; pop. 685,000; rich Chinese city; silk, rice: H-210, *map* C-212
- Hanging Gardens of Babylon**, one of the Seven Wonders of the World S-81-2, *picture* S-83
- Hangö** (*häng'ü*), Finnish **Hanko** (*häng'kö*), seaport on Gulf of Finland at entrance to Gulf of Bothnia; pop. 8000; called "Gibraltar of Finland" because of strategic position; after Russo-Finnish War of 1939-40 leased to Russia for 30 years as naval base: *map* E-326e
- Hankow**, China, city 600 mi. up the Yangtze River from Shanghai; pop. Hankow district 1,500,000: H-210-11, *maps* C-212, A-332b
Japanese conquest C-221n-o
- Hanks**, Nancy (1784?-1818), mother of Abraham Lincoln L-139, 140
- Han'na**, Marcus Alonzo (1837-1904), American merchant and politician,

ü=French u, German ü; ðem, ðo; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

born New Lisbon, Ohio; lived in Cleveland; friend, adviser, and political backer of President McKinley; U.S. senator 1897-1904
McKinley and M-14, 15

Hannah, a pious Hebrew woman, wife of Elkanah and mother of the prophet Samuel.

Hannay (*hän'ä*), James Owen. *See in Index* Birmingham, George A.

Han'nibal (247?-183 B.C.), Carthaginian general H-211-12 bust, *picture* R-131 crossing Alps H-211, *picture* H-213

Hannibal, Mo., manufacturing city and trade center on e. state border on Mississippi River; pop. 20,865; scene of Mark Twain's boyhood and setting of his 'Huckleberry Finn' and 'Tom Sawyer': *map* M-208 statue, *picture* T-169

Han'no, the name of several Carthaginian soldiers and statesmen, the best known being an admiral who explored n.w. coast of Africa about 500 B.C., and Hanno the Great (3d century B.C.), statesman and general, opponent of Hamilcar and Hannibal.

Hannover. *See in Index* Hanover

Hano, a Tewa Indian pueblo established among the Hopi in Arizona in 1700 by migrants from the Rio Grande in New Mexico; often, but improperly, called "Tewa."

Hanoi (*hä-noi'*), cap. and one of largest cities of French Indo-China, in n. on Songkoi (Red) River; also cap. of Tonkin protectorate; pop. 150,000; trade in silk, rice: I-73c, *maps* I-73b, A-332a, c university I-73d

Hanotaux (*ä-nö-tö'*), Gabriel (born 1853), French politician and historian; 'History of Contemporary France', standard work in its field; edited 17-volume 'History of the French Nation'; was at various times minister of foreign affairs, and ardently supported French-Russian alliance; in 1921 delegate to League of Nations.

Han'over, also Hannover, a Prussian province in n.w. Germany; 14,897 sq. mi.; pop. 3,540,000: H-212

Hanover, also Hannover, cap. of Prussian province of Hanover; pop. 475,000: H-212, *map* G-66

Hanover, N.H., town on Connecticut River 55 mi. n.w. of Concord; pop. 3425: *map* N-86

Dartmouth College, *picture* N-87

Hanover, Pa., borough 32 mi. s. of Harrisburg in rich agricultural region; pop. 13,076; wire products, paper, shoes, silk.

Hanover, House of, also House of Brunswick, line of British rulers H-212, G-52

Act of Settlement A-211

ends with Victoria V-295

rulers, list of E-270

Hanover College, at Hanover, Ind.; founded by Presbyterians in 1827; chartered under present name 1833; liberal arts.

'Hans Brinker or The Silver Skates', story by Mary Mapes Dodge telling of journey from Amsterdam to The Hague on skates L-162

Hanseatic League, medieval confederation of n. European cities for promotion of commerce H-212

Bergen N-174

Bremen B-234

Danzig D-14

flag, adopted by Danzig F-94, *color plate* F-88

Hamburg H-204

merchant guilds and G-88

Riga R-107

'Hänsel und Gretel' (*hën'sl unt grä'tl*), German folk-tale, retold by Grimm; subject of opera by Humperdinck (1893).

Hansen (*hän'sën*), Gerhard Henrik Armauer (1841-1912), Norwegian physician, discoverer of leprosy bacillus.

Hanska, Countess Evelina, Balzac's wife B-35

Hanson, Howard (born 1896), American composer, born Wahoo, Neb.; director, Eastman School of Music, Rochester, N.Y.; besides various choral and orchestral pieces, composed opera, 'Merry Mount', and two symphonies, 'Nordic' and 'Romantic'.

Hanson, John (1715-1783), American statesman; born Charles County, Md.; represented Maryland in Continental Congress 1781-83, and was first president elected (1781) under Articles of Confederation; served for one year.

Hanson, Timothy, New England agriculturist for whom timothy grass was named A-53

Hanuka, or Chanukah (*kän'q-kä*), Jewish festival commemorating renewed services in Temple at Jerusalem which had been desecrated by Antiochus IV, but was restored under the leadership of Judas Maccabaeus; begins with 25th day of Kislev (December) and lasts 8 days; on first night a candle is lighted and on each successive night a new one is added; also known as Feast of Lights and Feast of Dedication. *See also in Index* Maccabees

Hanuman (*hän-u-män'*), an East Indian monkey M-229-30, *picture* M-228

Hanyang (*hän-yäng'*), China, city adjoining Hankow H-211

Hapgood, Norman (1868-1937), American writer and editor, born Chicago; editor *Collier's Weekly* 1903-12; *Harper's Weekly* 1913-16; *Hearst's International* 1923-25 ('Abraham Lincoln'; 'George Washington'; 'The Changing Years').

Hapsburg (*häps'bürg*, German *häps'-bürk*), or Habsburg, famous German princely family which supplied rulers for Austria, Spain, and Holy Roman Empire H-212-14. For lists of important rulers *see in Index* Holy Roman Empire; Spain, history of

Austria A-382-3, V-297, 298

Bohemia B-167

Charles V's possessions C-146

decline under Francis Joseph I F-186

Germany G-72

Hungary acquired F-192

Netherlands N-72

Switzerland S-351: battle of Sem-pach W-114

Tuscany F-108

World War (1914-18) brings down-fall W-165

Hara (*hä'rá*), Takashi (1856-1921), first commoner to become prime minister of Japan (1918), and first prime minister directly responsible to parliament; previously leader of Seiyu-Kai (Liberal) party and three times minister of home affairs; assassinated.

Hara-kiri (*hä'rü kërë*), suicide by disembowelment, practised in Japan; obligatory hara-kiri, formerly common, abolished in 19th century, but voluntary form is still practised out of loyalty to a dead superior, to avoid dishonor in battle, or as protest against a national policy.

Harald. *See in Index* Harold

Harar (*hä-rär'*), city in east central Ethiopia; pop. about 40,000; center of fertile coffee district; large caravan trade: *map* E-308

Har'bin, or Kharbin, railroad center on Sungari River in e. cent. Manchukuo; pop. 470,000: M-52, 51, *maps* M-49a, A-332b

Harbor. *See in Index* Harbors and ports

Harbor Bridge, Sydney, Australia, *table* B-342

Harbord, James Guthrie (born 1866), American army officer, born Bloomington, Ill.; entered army 1889 as private; notable services in 1st World War, during which he attained rank of major general; chief of staff, A. E. F., 1917-18; commanded Marine brigade June-July, 1918; retired from army 1922; president, later chairman of the board, Radio Corporation of America: W-172

Harbor Grace, Newfoundland, second seaport of the island, on Conception Bay, connected with St. Johns, 25 mi. w., by Newfoundland River; pop. over 2000; boots and shoes, cod-liver and seal oils, fish; popular starting point for transatlantic fliers.

Harbors and ports H-214-17

African coast line A-34

American colonial seaports A-165

civilization affected by H-214

defense artillery A-307

docks H-216-17. *See also* Dock

Europe E-316

formed by "drowned coasts" P-200, N-153, H-215

free port T-13b, H-214

Great Lakes G-147

Hawaii H-241

international law I-109, 110

maintenance and improvements

H-215-17

natural harbors H-214-16

New Zealand, *picture* N-136

North America N-150, 153

quarantine rules, U. S. H-257

requirements for H-214-15

South America S-205a, e

tonnage dues, basis of S-130

Harbor seal, or "leopard" seal S-68, 70

Har'court, Sir William Vernon (1827-1904), English statesman and debater; loyal lieutenant of Gladstone; home secretary 1880-85; as chancellor of exchequer 1892-95 introduced graduated income tax; after Gladstone's retirement 1894 he led Liberals in House of Commons, but disagreements with Rosebery led him to retire in 1898.

Hardanger (*här'däng-ër*) Fjord, inlet 75 mi. long on w. coast of Norway, *map* N-173

"Hard Cider Campaign" H-232

Hard coal, or anthracite C-284, 286, 288

Pennsylvania P-113, S-51

Hardee, William J. (1815-73), American soldier, born Camden County, Ga.; graduated from U. S. Military Academy; served in Mexican War and fought skilfully as brigadier general in Confederate army.

Harden (*här'dën*), Maximilian (1861-1927), German writer and editor; was attacked and several times imprisoned for hostility toward Prussian imperialism.

Hardenberg (*här'dën-bërk*), Karl August, Prince (1750-1822), Prussian statesman; with Stein, re-builder of Prussia after Napoleonic wars; abolished serfdom.

Hardening metals carburization C-419 nitriding process I-146

- Hard'hack, a species of spirea S-259
- Hardicanute (*här-di-kä-nüt'*) (1019-42), king of England, son of Canute; ruled over Denmark and west Saxons while his brother, Harold I, ruled in North; succeeded him in 1040; brief reign marked by cruelty.
- Hardie, James Keir (1856-1915), British labor leader, born in Lanarkshire, Scotland; led the Scottish Labor party (1889) and the Independent Labor party (1893); after 1906 leader of Labor party in House of Commons.
- Harding, Chester (1792-1866), American portrait painter, born Conway, Mass.; was first an itinerant portrait painter; later in Boston and London became successful painter of prominent Americans and Englishmen; work clear and straightforward and full of character, though lacking in technique.
- Harding, Florence Kling (1860-1924), wife of President Harding W-93
- Harding, Warren Gamaliel (1865-1923), 28th president of U.S.: H-218-20
- administration (1921-23) H-218-20
- budget bureau established D-21
- Fordney-McCumber tariff H-219
- Hoover as secretary of commerce H-335
- immigration, first quota law I-23
- oil leases H-220
- Taft chief justice T-4
- treaties ending World War W-174
- Washington conference and treaties H-219, P-92
- character H-218, 220
- election W-174, H-218
- wife W-93
- Hardinge (*här'ding*) of Penshurst, Charles Hardinge, first Baron (born 1858), viceroy of India 1910-16; put into effect Morley-Minto reforms; loyalty of India during 1st World War largely due to universal esteem for viceroy; moved capital to Delhi and held famous "durbars" 1911; his grandfather, Henry Hardinge, first Viscount (1785-1856), was governor-general of India 1844-48.
- Harding grass, a common name for the perennial grass *Phalaris stenoptera*; native home unknown but grown in California; used as forage plant, grows to one foot, with short branching rootstock, narrow leaves; lilac spikelike clusters; also called Peruvian winter-grass.
- Hard maple. *See in Index* Sugar maple
- Hardness, in physics P-190
- diamond D-60
- minerals, scale of M-181
- substances that are hardest A-131
- Hardpan, hardened bed of earth sometimes found underneath surface soil.
- Hard-paste porcelain P-330
- Hard-shelled clam, little-neck, round clam, or quahaug C-259
- Hard soap S-175, 177
- Hardtack, unsalted, unleavened hard bread, used by campers and soldiers B-229, 232
- Hard times. *See in Index* Panics
- Hardwar (*här'dwār*), India, ancient town in n., on right bank of Ganges River; pop. 33,000; Hindu place of pilgrimage; large annual fair.
- Hard water W-45, C-19
- soap for S-177
- Hard wheat W-81: bread B-229
- Hardwick, Vt., village 20 mi. n.e. of Montpelier; pop. 1607; granite.
- Hardwood F-154-5, pictures T-132-5
- greatest center in U. S. M-114
- West Virginia W-77
- Hardy, Arthur Sherburne (1847-1930), American diplomat and novelist, born Andover, Mass.; professor of mathematics at Dartmouth; minister to Greece and Spain; brilliant stylist and romancer ('But Yet a Woman'; 'Passe Rose').
- Hardy, Thomas (1840-1928), great English novelist and poet, noted for somber view of life H-220, picture E-288
- work characterized E-287, H-220
- Hare, William H. (1838-1909), Protestant Episcopal bishop, born Princeton, N. J.; for 36 years "Apostle to the Sioux" in South Dakota; founded successful boarding schools for Indians.
- Hare H-221-3. *See also in Index* Rabbit
- distinguished from rabbit H-221.
- R-9, P-154
- fur H-222
- length of life, average, pictograph A-198
- pets. care of P-154-5
- trap for T-128-9
- Hare, or Lepus, a constellation, chart S-275f
- Harebell, or bluebell B-159, G-10
- Harefoot, nickname of King Harold I of England H-225
- Hare-lip, source of name H-221
- Har'em, in Mohammedan countries, apartment of a house reserved for female members of family; also the women themselves. Life in harem closely regulated by custom; usually under direction of "chief wife."
- Hare's-tail grass, a genus, *Lagurus*, with one species (*L. ovatus*) of the grass family, native to Mediterranean; grows to one foot; leaves downy, clasping stems of the oval, downy-white clusters like the tail of a rabbit; used in bouquets as an everlasting.
- Hare system of proportional representation, in city government M-302
- Hare wallaby K-2
- Harfleur (*är-fäär*), town in n. France 4 mi. e. of Havre; pop. 5000; formerly important seaport; twice occupied by English in 15th century; pillaged by Huguenots in 1562.
- Hargreaves (*här'grēvz*), James (1730-78), inventor of the spinning jenny H-224
- Arkwright and A-299, 300
- inventions before and after I-74c
- Haricot (*här'i-kō*), French name for the kidney bean B-65
- Haring, George Wilhelm Heinrich. *See in Index* Alexis, Wilibald
- Harkness, Stephen Vandeburg (1818-88), American business man, associated with John D. Rockefeller; family have been important philanthropists; his widow, Anna M. Richardson Harkness (1838-1926), established the Commonwealth Fund; his son, Edward Stephen Harkness (born 1874), gave large sums to Harvard, Yale, Columbia, and the New York City Medical Center.
- Harlan, James (1820-99), American lawyer and legislator, born Clark County, Ill.; U. S. senator from Iowa, and for years a Republican leader in that body; appointed secretary of the interior in 1865 by President Lincoln, whose son Robert married Harlan's daughter.
- Harlan, John Marshall (1833-1911), associate justice of the U.S. Supreme Court from 1877 to his death; term of service exceeded only by Chief Justice Marshall; was a liberal constructionist of the Constitution and generally favored increase in federal power.
- Harland, Henry (1861-1905), Anglo-American novelist, born St. Petersburg (now Leningrad); educated in U.S., lived later years in London; 'The Cardinal's Snuffbox' by far his best and most popular novel; edited *The Yellow Book*.
- Harland, Marion. *See in Index* Terhune, Mary Virginia
- Harlech (*här'lēk*), ancient seaport in w. Wales; ruins of Harlech Castle, captured by Yorkists 1468.
- Harlem River, N. Y., a boundary of Manhattan Island, map N-180
- tunnels T-154
- Harlequin (*här'lē-kuin*), in old comedy and pantomime, conventional character in spangled motley, in love with Columbine; C-816
- Harlequin, a coral snake S-172
- Harlequin opal G-29
- Harley, Robert, Earl of Oxford (1661-1724), English statesman, born London; secretary of state (1704), lord treasurer (1711). The books and manuscripts collected by Harley and son Edward are known as the Harleian Collection; L-105
- Har'lingen, Tex., city in lower Rio Grande Valley 225 mi. s. of San Antonio; pop. 13,306; citrus fruits, cotton, vegetables; cotton gins and compresses, canning plants
- Harmar, Josiah (1753-1813), American soldier, born Philadelphia; served under Washington and Lee in Revolutionary war; unsuccessful in quelling Indian uprisings n. of Ohio River (1785-87, 1790); adjutant general of Pennsylvania (1793-99).
- Harmat'tan, a dry wind blowing from the Sahara Desert over w. coast of n. Africa; accompanied by dry weather and hazy atmosphere; because of extreme dryness weather seems cooler.
- Harmo'dius. *See in Index* Aristogiton
- Harmon, Daniel Williams (1778-1845), Canadian fur trader and author, born Vermont; joined North-West Company in 1800 ('Journal of Voyages and Travels in the Interior of North America').
- Harmonic, in sound, an overtone S-197
- Harmon'ica, French harp, or mouth organ H-224-5
- Harmonica Institute of America H-225
- Harmonic minor scale, in music S-198
- Harmo'nium, reed organ, or cabinet organ O-250, picture M-322
- Harmony, in color C-308d-e, j
- dress design D-112
- Harmony, in music M-319, 310
- Harms'worth, Alfred. *See in Index* Northcliffe, Viscount
- Harnack (*här'näk*), Adolf von (1851-1930), German theologian, held chair of theology at Glessen, Marburg, and Berlin; director Prussian National Library 1905-21; an authority in early church history; exercised wide influence; encouraged open-minded criticism of theology; sought to reconcile science and Bible ('History of the Christian Dogma'; 'What Is Christianity?').
- Harnden, William F. (1812-45), American businessman, born Reading, Mass.; pioneer in express service; established package-carrying agency between New York and Boston (1839) and later added branches to Albany and Philadelphia.

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

Har'ned, Virginia (born 1868), American emotional actress, remembered for her creation of Trilby in the play of that name.

Harness, complete dress or trappings of an animal, especially the horse; in medieval times, defensive armor.

Harney, William S. (1800-89), American general; won distinction fighting Indians in Florida Everglades and in battle of Cerro Gordo in Mexican War; later fought Indians in the West; recalled from command of Oregon territory for seizing San Juan Island, claimed by British; Harney Peak, highest point in Black Hills, named for him.

Harney Peak, highest point of Black Hills, in s.w. of South Dakota; 7242 ft.

Harnoncourt, René d' (born 1901), illustrator of children's books, born Vienna, Austria; now living in United States; authority on folk art of the Mexican Indian; picture books, 'Mexicana', 'Hole in the Wall'; also illustrated 'Painted Pig' and 'Beast, Bird and Fish' by Elizabeth Morrow.

Harold I (died 1040), king of England; illegitimate son of Canute H-225

Harold II (1022?-66), king of England, last Anglo-Saxon king H-225 battle of Hastings H-233

Harold I, or Harald (850-933), "Fair Hair," first king of united Norway; succeeded 872; conquered local kings who with many malcontents fled to Iceland, the Orkney, Shetland, and Hebrides islands to escape taxation.

Harold III Sigurdsson, or Harald (1015?-66), king of Norway, succeeded 1047; with Tostig, exiled brother of Harold II of England, sought to conquer England; slain at Stamford Bridge Oslo founded by O-252

Haroun-al-Raschid. See in Index Harun-al-Raschid

Harp, constellation. See Lyra

Harp, stringed musical instrument H-225, 227

Aeolian A-28

South American Indian, picture S-206

Harpagon (*ar-pà-jôn'*), the miser in Molière's 'L'Avare'.

Harpaston, ancient football game F-151a

Harper, Theodore Acland (1871-1942), American writer, born Christchurch, New Zealand; mining engineer in Alaska, Siberia, and other parts of world; wrote adventure stories for boys, many with wife, Winifred Mary Hunter-Brown Harper ('Siberian Gold'; 'Kubick the Outlaw'; 'Mushroom Boy').

Harper, William Rainey (1856-1906), American Semitic scholar and educator, born New Concord, Ohio; first president of University of Chicago, 1891 to his death Memorial Library, picture I-16

Harpers Ferry, W. Va., town at junction of Shenandoah and Potomac rivers; pop. 665: W-74, map W-76 Civil War C-254, map C-253 early route through U-183 flood, picture F-106a John Brown's raid B-250

Harpoon

Eskimo, picture E-302

Stone Age, picture S-293

Harpoon gun W-80, picture W-78

Harp seal, Greenland seal, or saddle-back S-70

Harp shell, picture S-109

Harp'sichord, forerunner of piano P-209, pictures P-210, 211

Har'py, bird monster in Greek and Roman mythology H-227

Harpy eagle (Aztec name, "flying wolf"), picture E-123

Har'raden, Beatrice (1864-1936), English novelist who leaped into fame overnight with her first novel, 'Ships that Pass in the Night', published in 1893.

Harran (*hâr-rân'*), Turkish village near Syrian border; in ancient times a thriving city named Carrae; now in ruins; Crassus slain here by Parthians 53 B.C. mud huts, picture A-326

Harrier, a hunting dog D-82

Har'riman, Edward Henry (1848-1909), noted American capitalist and railway organizer, born Hempstead, N.Y.; obtained control of and rehabilitated the bankrupt Union Pacific 1898; failed in contest with J. J. Hill for control of Northern Pacific 1901, but dominated railroad world before his death contest with Theodore Roosevelt over Northern Securities Co. R-151

Harriman, Florence J. (born 1870), public official, born New York City; minister to Norway after 1937; manager New York State Reformatory for Women 1906-18; only woman member Federal Industrial Relations Commission 1913-16; Democratic national committee-woman (From Pinafores to Politics').

Harris, Corra May (White) (1869-1935), American writer, born Farm Hill, Ga.; married Rev. L. H. Harris, who died 1910 ('A Circuit Rider's Wife'; 'My Book and Heart').

Harris, Frank (1856-1931), American author and critic, born in Ireland; came to U.S. when 14; later lived chiefly in Europe; edited magazines in England and U.S.; many of his writings notorious for their frankness ('The Man Shakespeare'; 'Oscar Wilde'; 'My Life and Loves').

Harris, J. (James) Arthur (1880-1930), American biologist and statistician, born Plantsville, Ohio; head of department of botany, University of Minnesota, after 1924; author of many technical papers on botany, zoology, and statistics study of basal metabolism B-118-19

Harris, Joel Chandler (1848-1908), American author, born Eatonton, Ga.; many years with *Atlanta Constitution*; unsurpassed for humorous and truthful portrayal of Negro character and folk-lore memorial in Atlanta A-358 'Uncle Remus Stories' F-135

Harris, Robert (1849-1919), Canadian painter, born Wales; noted for portraits and genre; president Royal Canadian Academy 1893-1906.

Harris, Roy (born 1898), composer, born Lincoln County, Okla.; 'Third Symphony' (1939) recognized as distinctively American; works include symphonic, vocal, and chamber music ('Song for Occupations'; 'Folk-song Symphony').

Harris, Townsend (1804-78), merchant, politician, diplomat, born Sandy Hill, N.Y.; while on N.Y. board of education put through legislation for College of the City of New York consul general to Japan J-184

Harris, William Torrey (1835-1909), American educator and philosopher, born North Killingly, Conn.; U.S.

commissioner of education 1889-1906; leading American expounder of Hegelian idealism.

Harrisburg, Ill., city in s. 62 mi. n.e. of Cairo; pop. 11,453; coal mining, agriculture; flour, packing-house products.

Harrisburg, Pa., state cap. and manufacturing city; pop. 83,893: H-227, map P-112 capitol, pictures P-115, H-226

Harrison, (Thomas) Alexander (1853-1930), American genre, landscape, and sea painter, born Philadelphia, Pa.; lived most of life in Paris; brother of L. Birge Harrison; work characterized by luminous color and delicacy of line; specialized in marines.

Harrison, Anna Symmes (1775-1864), wife of Pres. W. H. Harrison W-90

Harrison, Benjamin (1740-91), American patriot, father of William Henry Harrison; delegate to Congress 1774-77; governor of Virginia 1782-85 signs Declaration of Independence H-231

Harrison, Benjamin (1833-1901), 23d president of U.S. H-227-31 administration (1889-93) Bering Sea arbitration H-230, S-70 Blaine secretary of state B-155, H-230 Chilean controversy C-208, H-230 first forest reserve F-157 foreign policy H-230-1 Hawaiian annexation fails C-267 McKinley tariff H-229, M-14 Oklahoma settled O-215-16 Samoan troubles H-230 Sherman Anti-Trust Act H-229, T-146, 147 Sherman Silver Purchase Act H-229-30, 231 six new states H-228, U-190 ancestry H-228, 231 defeated for reelection C-266 wife W-92-3

Harrison, (Lovell) Birge (1854-1929), American painter, born Philadelphia; best known for snow scenes and for paintings of city streets; especially skilful in depicting moonlight, twilight, and misty atmosphere.

Harrison, Caroline Scott (1832-92), wife of Pres. Benjamin Harrison W-92-3

Harrison, Constance Cary (Mrs. Burton Harrison) (1846-1920), American novelist, born Vaucluse, Va. ('A Daughter of the South'; 'Old-Fashioned Fairy Book'; 'Folk and Fairy Tales').

Harrison, Frederic (1831-1923), English historian, jurist, literary critic, and positivist philosopher; voluminous writer ('The Meaning of History'; 'Positive Evolution of Religion'; 'The Choice of Books'; 'Among My Books').

Harrison, Henry Sydnor (1880-1930), American novelist, born Sewanee, Tenn. ('Queed'; 'V. V.'s Eyes').

Harrison, John (1693-1776), English inventor of devices for improving clocks and watches N-47

Harrison, William Henry (1773-1841), 9th president of U.S. H-231-2 presidential campaign H-232 War of 1812 H-232, W-10 wife W-90

Harrison, N. J., a suburb of Newark on the Passaic River; pop. 14,171; large pump, elevator, and steel plants; railroad center.

Harrison Anti-Narcotic Act N-12

Harrod, James (1742-93), pioneer and soldier, born Pennsylvania; in 1774 founded first settlement in Ken-

Key—cåpe, át, fär, fást, whqt, fglł; mē, yēt, fērn. thére; íce, bít; rōw, wón, fōr, nōt, dq; cūre, bāt, ryde, fyll, bårn.

- tucky at Harrodsburg; opposed Richard Henderson and his Transylvania scheme; took active part in wars against Indians; elected to Virginia legislature 1779; mysterious disappearance from his home led to belief that he was murdered.
- Harrodsburg, Ky.**, county seat of Mercer County, 60 mi. s.e. of Louisville; pop. 4673; first settlement (1774) in Kentucky; location of Fort Harrod: *map K-11* early cabin, *picture U-238*
- Harrogate**, fashionable inland watering place in n. England 15 mi. n. of Leeds; pop. 40,000; medicinal springs.
- Harrow**, a farm implement, *picture A-51*
- Harrow School**, famous English school for boys at Harrow-on-the-Hill, 12 mi. n.w. of London; founded 1571: *E-175*
- Harry E. Burroughs Newsboys Foundation**, Boston, Mass.; established 1928 by Harry E. Burroughs to raise the cultural level of the newsboy.
- "Harry Hotspur."** See in *Index* Percy, Sir Henry
- Hart, Albert Bushnell** (1854-1943), American historian and educator, born Clarksville, Pa.; professor at Harvard 1883-1926 ('Formation of the Union'; 'Essentials of American History' series; 'Epochs of American History').
- Hart, John** (1714?-80), signer of Declaration of Independence; born Hopewell, N. J.
- Hart, Moss** (born 1904), American playwright, born New York City; with George S. Kaufman wrote 'Merrily We Roll Along', about a writer's loss of ideals; 'You Can't Take It with You', a farce comedy; 'I'd Rather Be Right', a musical comedy about the New Deal; 'The American Way', a challenge to the threat of fascism.
- Hart, Nancy**, American heroine of the Revolution; among her many heroic deeds was the capture of six Tories who came to her cabin in Georgia, ordering her to prepare food; highway through Georgia to Florida named in her honor.
- Hart, Sir Robert** (1835-1911), Anglo-Chinese statesman; as inspector-general of imperial Chinese customs, 1862-1907, placed Chinese national finance on solid footing.
- Hart, the mature male of the red deer.**
- Hartebeest**, or *hartebeest*, African antelope (*Bubalis cama*) about 4 ft. high, with long face and spreading horns curving sharply backward at the tips; grayish brown (some species reddish) in color; valued for hide and flesh.
- Harte, Francis Bret** (1839-1902), American writer of stories of Western life *H-232*, *picture A-179*
- Hartford, Conn.**, state cap. and manufacturing center; pop. 166,267: *H-233*, *C-339*, *map C-336*
- Charter Oak C-340**, *picture C-339*
- first school for deaf *D-22*
- state capitol, *picture C-337*
- Hartford Convention** (1814) *W-10-11*
- Hartlepool** (*här'tl-ppl*), England, a borough and port on n.e. coast, comprised of Hartlepool (25,000) and its extension, West Hartlepool (68,000); exports coal, iron ores; shipyards, iron and steel works: *map E-270a*
- Hartley, David** (1705-57), English philosopher; founded associationist school of psychology; held mind is a blank until written upon by sensations, sensations being caused by vibration of the tiny particles of medullary substance of the nerves ('Observations on Man, his Frame, his Duty, and his Expectations').
- Hartmann, Karl Robert Eduard von** (1842-1906), German philosopher; taught that existence is evil, and happiness an illusion ('Philosophy of the Unconscious').
- Hartnett, Cornelius**, North Carolina leader *N-159*
- Harts'horn**, spirits of, old name for ammonia *A-188*
- Harty, Sir Herbert Hamilton** (1879-1941), conductor, composer, pianist, born County Down, Ireland; conducted London Symphony and Manchester Hallé orchestras and after 1932 conducted in Australia and U. S. ('Ode to a Nightingale'; 'Violin Concerto in D Minor'; 'Irish Symphony').
- Harun-al-Raschid** (*hā-rūn'al-rā'shēd*), or Haroun-al-Raschid, Abbasid calif of Bagdad 786-809; scholar, poet, patron of learning, literature, and music; one of greatest princes of his day, but a poor administrator: *E-14*
- 'Arabian Nights' hero *A-244*
- Harunobu, Suzuki** (1724?-70?), Japanese painter, one of the first great masters of the color print *J-202*
- Harvard, John** (1607-38), Puritan clergyman, born London, England; removed to America 1638; at death left library and half of estate to college at Newtown, Mass. (changed to Cambridge 1638); college name changed to Harvard; thus regarded as founder of Harvard University.
- Harvard Classics E-251**
- "Harvard of the South" H-346**
- Harvard Peak** (14,399 ft.), one of the "College" peaks in central Colorado.
- Harvard University**, the oldest institution of higher learning in U. S., founded 1636 at Cambridge, Mass.; for men; non-sectarian; Harvard College, engineering and dental schools; graduate schools of law, divinity, medicine, dentistry, business administration, architecture, landscape architecture, city planning, education, public health, and arts and sciences; associated is Radcliffe College, for women
- Agassiz A-45-6*
- boat races B-163*
- football influenced by F-151b*
- Harvard House, Stratford-on-Avon S-305*
- medical school, picture M-81*
- museums. See in Index Museums, table*
- observatories O-194*
- President Eliot's influence E-251*
- Rumford professorship and fund H-259*
- Harvard University Library**, oldest library in U.S.; formed 1638; including college and departmental collections, is the third largest in U.S.; main collection housed in Widener Memorial Library, built 1914 in memory of Harry Elkins Widener, a young bibliophile and Harvard alumnus, who drowned with the sinking of the Titanic; famous collections contain rare editions and manuscripts; parts of the private libraries of Longfellow, James Russell Lowell, Amy Lowell, and others; remarkable theater collection: *L-106f*, *picture L-106f*
- Harvest ant A-203**
- Harvest festivals T-74**
- England *H-323*
- Japan, *picture H-321*
- Thanksgiving *T-74*, *picture H-319*
- Harvest fish. See in Index** Butter-fish
- Harvest-fly**, a species of cicada *C-235*
- Harvest hats C-275**
- Harvesting**, in agriculture combine, harvester-thresher *T-86*, *A-49*, *picture A-55*
- corn, methods *C-367*, *picture A-54*
- cotton picking *C-375*, *I-117*, *picture I-116*
- guayule harvesting *G-182*
- hemp harvesting *H-272*, *pictures H-273*
- inventions *A-49*
- opium, in China, *picture O-235*
- pioneer American *P-221f*
- reaping machines *R-59*; McCormick invents *M-3*, *picture A-49*
- threshing machine *T-86*: primitive, *pictures A-58*, *E-195*
- wheat harvesting *W-81*, *picture A-55*
- Harvestman**, or daddy-long-legs, a spider-like arachnid with small body and unusually long legs *S-257*
- Harvest-mite S-258**
- Harvest moon**, full moon occurring nearest to autumnal equinox, September 22. About this time, the moon rises at sunset and sets at sunrise, exactly opposite the sun.
- Harvest mouse M-293**
- foot, *picture F-147*
- Harvey, George Brinton McClellan** (1864-1928), American editor and diplomat; ambassador to Great Britain 1921-23
- relations with Wilson *W-106*
- Harvey, William** (1578-1657), English anatomist, physician, and discoverer of the circulation of the blood; born at Folkestone; studied at Cambridge University and at Padua; fellow of the Royal College of Physicians: *E-158*, *A-191*
- Harvey, Ill.**, residential and industrial city near Calumet River 19 mi. s. of Chicago; pop. 17,878; highway machinery, railway cars, stoves, Diesel engines.
- Harvey steel process**, a method of toughening battleship armor plate: *N-54*
- Harwich** (*här'ij*), England, town on e. coast, 65 mi. n.e. of London; pop. 13,000; port for passenger ships; fisheries, shipbuilding: *map E-270a*
- Harz** (*härts*) Mountains, in w.-central Germany *H-233*, *map G-66*
- canaries *C-69*
- caves *C-117*
- Hasa** (*häs'sä*), El, district in e. Arabia on Persian Gulf; pop. 150,000; many springs, hot and cold: *A-238*, *map A-242*
- Hasan** (*häs'sän*), and Husein (*hy-sin'*), grandsons of Mohammed, sons of Fatima and Ali; killed 669 and 680 A.D. by adherents of the Ommayyad califs and revered as martyr saints by the Shiites.
- Has'drubal** (died 207 B.C.), Carthaginian general, son of Hamilcar Barca and brother of Hannibal slain at the Metaurus *H-211*
- Hasenclever** (*häs'en-klä-ver*), Walter (1890-1941), German writer of expressionistic plays ('The Son'; 'Beyond'; 'Marriages Are Made in Heaven').
- Hashish** (*häs'hesh*), or hasheesh, also called marihuana, a narcotic drug obtained from hemp *N-12*, *H-272*
- assassins named from *A-338*
- Hashishins**, or Assassins *A-338*
- Haskell Institute**, vocational school for Indians at Lawrence, Kan.; founded 1883; maintained by U. S. government; high school and junior

college courses, with normal training, business training, and physical education.

Has'sam, Childe (1859-1935), American impressionistic painter and etcher, born Boston, Mass.; known for landscape, figure, and sea paintings; remarkable colorist and skillful and masterly luminist ('Summer Sea'; 'Lorelei'; 'The Church at Old Lyme').

Hassan ben Sabah (*häs'än bën sä-bä'*) (died 1124), founder of the sect of Assassins A-338

Hassler, Hans Leo (1564-1612), German composer, greatest of his age; pupil of Andrea Gabrieli; tune used by Bach M-311

Hastati (*häs-tä'ti*), in Roman Legion A-307f

Hastings, Sue (born 1884), American producer and director of marionettes, born Monticello, N.Y.

Hastings, Thomas (1860-1929), American architect, born New York City; entered into partnership with John M. Carrère, 1885. *See in Index* Carrère, John M.

Hastings, Warren (1732-1818), first governor-general of India H-234

Hastings, William, Baron (1430?-83), English soldier and confidential advisor of Edward IV executed R-105

Hastings, England, port in Sussex, popular watering place; one of Cinque Ports; pop. 65,000; fisheries: map E-270a

Hastings, Neb., city 90 mi. w. of Lincoln in agricultural and stock-raising district; pop. 15,145; brick, tile, farm implements; dairy products; Hastings College; state insane asylum: map N-57

Hastings, battle of (1066) (also called battle of Senlac) H-233-4, W-101

Hastings College, at Hastings, Neb.; Presbyterian; opened 1882; classics, sciences, philosophy, normal work, music, oratory.

Hatasu. See in Index Hatshepsu

Hatay, The, formerly the Sanjak of Alexandretta, geographically part of Syria; after 1st World War, under French mandate of Syria; in 1939 France ceded the region to Turkey; pop. about 230,000 (40% Turks); area 1930 sq. mi.; principal cities, Alexandretta and Antioch.

Hatch Act, "to prevent pernicious political activities" (passed 1939, amended 1940); among its prohibitions are: government employees, or state employees who are paid in part from federal funds, are forbidden from taking part in political campaigns and from joining any party or organization which advocates overthrow of the constitutional form of government in U.S.; expenditures for campaign purposes are limited: R-146m

Hatcheries, fish F-76-8. *See also in Index* Fish culture

Hatchet, a tool C-45

Hatchet-footed mollusks, or pelecypods (*pē-lēs'i-pōdē*) M-218

Hatchett, Charles (1765-1847), English chemist, discovered columbium.

Hatchway, of ship, picture S-121

Hathaway, Anne (1556-1623), wife of William Shakespeare S-95, 97

burial place S-305

cottage, picture S-100h

Hathor. See in Index Athor

Hathorne, William (1607?-81), colonial official and reformer, born Binfield, Eng.; lived in Salem, Mass., from 1636 until his death.

Hats and caps H-235-6

army and navy U-180, 181

Bangkok C-275

beaver B-71, F-225

Burma, picture B-279

cardinal's C-83

Chinese C-216, picture C-217

choosing a hat D-113

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P-113

fez, Turkish law forbids T-161

Indo-China I-73c, picture I-73d

Korea K-39

leghorn hats C-275

making H-235-6, pictures H-237,

V-313

Panama hats H-235: making H-235,

pictures P-311, L-67f

sects and parties distinguished by

H-236

shellac used to stiffen C-275, H-235

sombrero C-114: Mexican, pictures

M-138, 142e

straw C-274-5: Tuscany C-273

styles, period, pictures D-108, 109

Thailand, picture T-73a

turban, pictures: Afghan A-30;

Algerian A-126; Arabian A-32,

A-241, H-343; Indian I-34, 38

United States manufactures H-235

"Hats" and "Caps," Swedish political

parties H-236

Hatshep'su, or **Ha'tasu** (about 1500

B.C.), queen of Egypt E-209

temple, picture A-251

Hat'teras, Cape, an easternmost island

of North Carolina, separated from

mainland by Pamlico Sound, map

N-156

recreational area N-22e

Hat'tiesburg, Miss., trade center for

cotton-growing and agricultural

district, 87 mi. s.e. of Jackson in

yellow pine belt; pop. 21,026; saw-

mills, cotton mills, naval stores;

state teachers college; Mississippi

Woman's College: map M-200

Hat'to (died 970 A.D.), archbishop of

Mainz; according to legend, de-

voured by rats

Mouse Tower, picture G-71

Hau (*hou*), a small tree (*Hibiscus*

tiliaceus) of the mallow family

found in the tropics; wood used for

boats; inner bark yields a rope

fiber.

Hauberk (*hə'bērke*), coat of mail

A-304, picture A-305

Hauff (*houf*), Wilhelm (1802-27).

German novelist and poet ('Lich-

tenstein', fine historical novel).

Hauptmann (*houpt'män*), Gerhart

(born 1862), German dramatist;

runs the gamut from Zola-like

realism to mystic symbolism;

awarded Nobel prize for literature

1912. ('The Weavers', 'The Sunken

Bell', dramas; 'Atlantis', novel;

'Till Eulenspiegel', narrative

poem): G-63, D-96

Hausas (*hou'säs*), African race of n.

Nigeria; among most intelligent of

central Africa; language widely

spread through their activity as

traders.

Hausegger (*hou'sēg-ēr*), Siegmund von

(born 1872), German musical con-

ductor and composer, born Grätz,

Austria; conductor in Austrian and

German cities; director, Academy

of Music, Munich; symphonic

poems, operas, choruses ('Barbaros-

sa'; 'Wieland der Schmied'; 'Hel-

fried'; 'Zinnober').

Hausmannite (*hou'smän-it*), an ore

of manganese, found as an oxide in

brownish black tetragonal crystals.

Hausmann (*ös-män*'), George Eugène,

Baron (1809-91), French official,

prefect of Seine 1853-70; famous for rebuilding Paris with wide boulevards.

Hautboy (*hö'boi*), or oboe, a woodwind musical instrument W-135, M-323

Haute-lisse (*öt lēs*), a tapestry weave T-10

Haute Savoie. See in Index Savoie

Haut Rhin (*ö rän*), department of Alsace A-137

Havan'a, Spanish Habana, cap. of Cuba, largest and most important city in West Indies; pop. 550,000:

H-236-8, maps C-412, N-150a, c, pic-

tures C-410, C-8, H-238

Columbus' burial place C-319

university library, picture L-106o

yellow fever conquered M-270, G-122,

S-42-3

Havana, Act of L-67p-q

Havasupai (*hä-vä-sy'pi*), a Yuman tribe of Indians living in Cataract Canyon of the Colorado River in n.w. Arizona.

Havelock (*häv'lök*), Sir Henry (1795-

1857), English general

anecdote of his youth O-192

relieves Lucknow L-211

Havelok the Dane, hero of old Anglo-Danish romance, son of Birkabejn

(or Gunter), king of Denmark; set

adrift on raft which bore him to

Lincolnshire coast, England; res-

cued by Grim, a fisherman; mar-

ried ward of king of Lincoln, and

became king of Denmark and of

part of England. Grim was re-

warded and built Grimsby.

Havel (*hä'fēl*) River, in n. cent. Ger-

many, a tributary of Elbe; rises in

Mecklenburg and flows s.; about

220 mi. long; linked by canals with

the Oder, Rhine, and Elbe rivers:

B-98, map G-66, picture B-99a

Haverford, Pa., seat of Haverford

College, 8 mi. n.w. of Philadelphia;

pop. 27,594.

Haverford College, Friends' institution

for men at Haverford, Pa.; founded

1833; arts and sciences.

Havergal (*häv'ēr-gäl*), Frances Ridley

(1836-79), English hymn writer;

daughter of evangelical clergyman

in Worcestershire; began to scribble

hymns at age of 7; simple expres-

sion of deep religious feeling ('Take

My Life and Let It Be'; 'Who Is

on the Lord's Side'; 'Golden Harps

Are Sounding').

Ha'verhill, Mass., industrial center on

Merrimack River, 33 mi. n. of Bos-

ton; pop. 46,752; large shoe manu-

factories; scene of many Indian

attacks; birthplace of Whittier

near by.

Havlicek (*häv'lē-chēk*), Karel (1821-

56), Bohemian poet and political

writer; editor of two Bohemian

publications; imprisoned for liberal

views, and died one year after re-

lease ('Tyrolese Elegies'; 'The Bap-

tism of St. Vladimir').

Havre (*äv'vr*), French Le Havre

(*lü ä'vr*), 2d seaport of France,

at the mouth of the Seine River;

pop. 165,000: H-239

Haw, fruit of the hawthorn H-248

Hawaii (*hä-wi'ē*), largest and south-

ernmost of the Hawaiian Islands;

4015 sq. mi.; pop. 73,276; highest

point Mauna Kea, 13,784 ft. The

name Hawaii is commonly used to

designate the entire group of Ha-

waiian Islands: H-239, 240, 241,

242, maps H-242, 243

Hawaii, University of, at Honolulu,

Hawaii; territorial institution es-

tablished 1907; arts and sciences,

applied science, education, graduate school.

Hawaiian (*hā-wāʻyān*) Islands, formerly Sandwich Islands, a territory of the United States; 6,407 sq. mi.; pop. 423,330; cap. Honolulu: H-239-45, maps H-243, 242, P-10b-c agriculture H-241, 242, 244, map H-243; pineapple P-221, picture H-242; rice H-242, picture H-239; sugar H-241, picture S-320 cities H-240-1, list H-239 climate H-239-40 commerce H-240 education H-243 flag F-91, color plate F-87 forests, state, table F-250 government H-245 history H-245: Cook's explorations C-348; early U.S. interest P-10; Japanese attack on Pearl Harbor H-241, W-178v, picture W-178u Honolulu H-240, pictures H-241, 244 manufactures H-243 music and dance H-244, picture P-8 national parks N-22a, H-242 natural features H-239, 240, 242 people H-244-5, 240: Polynesian ancestry P-4-5 plant and bird life H-243-4 products, list H-239, map H-243 transportation and communication H-243 volcanoes H-242: Kilauea crater, pictures H-240, L-73, V-332, 334

Hawes, Charles Boardman (1889-1923), author, born Clifton Springs, N. Y.; sea romances for young people; Newbery medal for 'The Dark Frigate', 1924 ('The Mutineers'; 'Great Quest').

Hawes, Silas, American inventor V-284

Hawes, Stephen (1475-1530), English poet ('Passetyme of Pleasure'; 'Example of Virtue').

Hawfinch, European grosbeak G-179

Hawk H-245-7, pictures B-123, color plate B-135 buzzard-hawks H-246, B-288 head, color plate B-130 injurious and beneficial B-122, 123 nest B-126, picture B-127 skeleton, picture S-155

Hawkbill, or **hawkbill**, a sea turtle T-167, T-116

Hawker, Harry G. (died 1921), Australian aviator, first to try Newfoundland-to-London flight (May 1919); rescued in mid-ocean; killed in plane crash July 12, 1921.

Hawkesbury, Ontario, town on Ottawa River 55 mi. e. of Ottawa; pop. 5177; lumber, pulp, and paper mills.

Hawkeye State, popular name for Iowa; from Burlington *Hawkeye*, one of famous newspapers in early history of American journalism.

Hawking, or **falconry** F-7, H-246

Hawkins, Sir Anthony Hope. See in *Index* Hope, Anthony

Hawkins, or Hawkyns, Sir John (1532-95), English adventurer and admiral, half patriot, half pirate H-247-8 voyages to America A-145, H-247

Hawkins, John Isaac, inventor of up-right piano P-211

Hawkins, Sir Richard (1562-1622), English admiral, son of Sir John; commanded vessel in attack on the Spanish Armada; commanded an expedition to South America 1583-97, but was captured by Spanish and imprisoned until 1602; later served in Parliament: H-248

Hawk-moth B-286

Hawks, Frank Monroe (1897-1933), American aviator, born Marshalltown, Iowa; captain U.S. Army Reserve; killed in plane crash: picture A-73

Hawks-beard. See in *Index* Crepis

Hawkesmoor, Nicholas (1661-1736), English architect; worked so intimately with Wren that it is impossible to make exact division of credit for their work

Westminster Abbey towers W-73

Hawkweed, a genus of perennial plants (*Hieracium*) of the family *Compositae* with loosely clustered yellow, orange, or white flower heads and oblong toothed leaves that grow from roots in rosette; troublesome weed in some places; an old superstition stated that hawks used the sap to sharpen their eyesight ground runners W-64

Hawley-Smoot Tariff Act, introduced by Representative Willis C. Hawley (1864-1941), of Oregon and Senator Reed Smoot (1862-1941), of Utah, passed in June 1930; greatly increased import duties on many agricultural and manufactured products; other nations retaliated by discriminating against imports from the U. S.

Haworth (*hō-wōrth*), England, urban district and village 8 mi. n.w. of Bradford; beautiful moorlands; famous as home and burial place of Charlotte, Emily, and Anne Brontë; Brontë museum and library; woolen manufactures.

Hawthorn, an ornamental shrub H-248 hedges H-269

Hawthorne, Charles Webster (1872-1930), American painter, born in Maine; well known for his figure paintings, especially for studies of Cape Cod and Provincetown fisher folk.

Hawthorne, Hildegard, poet and author, born New York City; daughter of Julian and granddaughter of Nathaniel Hawthorne; published first book in 1904; books for children based on original sources and personal reminiscences of her father; 'Romantic Rebel, the Story of Nathaniel Hawthorne'; 'Youth's Captain, the Story of Ralph Waldo Emerson'; 'The Happy Autocrat. A Life of Oliver Wendell Holmes'; 'Concord's Happy Rebel, Henry David Thoreau'.

Hawthorne, Julian (1846-1934), American novelist, born Boston, Mass.; son of Nathaniel Hawthorne ('Garth'; 'Sebastian Strome').

Hawthorne, Nathaniel (1804-64), American novelist H-248-9, A-179, pictures H-248, A-179 home in Concord C-328 Longfellow's comment L-193 place in history of novel N-163 quoted on Shakespeare S-100c story of Evangeline given Longfellow L-194 'Wonder Book' L-161

Hawthorne, N. J., a borough on Passaic River 3 mi. n. of Paterson; pop. 12,610; stockings, textile dyeing and printing.

Hay, Ian. See in *Index* Beith, John Hay

Hay, John (1838-1905), American statesman, diplomat, and writer, born Salem, Ind. M-16, C-221k, picture M-15 Morocco trouble M-259

Hay, dried grass or other plants used as fodder H-249. See also in *Index* Forage crops harvesting, modern A-49 plants used for: alfalfa A-116-17; clover C-231-2; millet M-176; peanut P-94; timothy A-53 producing regions in U. S., map U-191 spontaneous combustion B-13

Hayden, Ferdinand Y. (1829-87), American geologist, born Westfield, Mass.; professor of geology University of Pennsylvania; director of geological survey of Western territories: N-15

Hayden-Curtwright Act, for road-building R-114-15

Haydn (*hā'dn*, German *hā'dn*), Franz Joseph (1732-1809), Austrian composer H-249, M-312-13 Austrian national hymn N-25

Hayes, Helen (born 1900), American actress, born Washington, D. C.; debut at age of six; early successes included 'Dear Brutus' with William Gillette; distinguished for charm and dramatic skill on stage, in motion pictures, and on radio (stage plays: 'Bab', Mary of Scotland, 'Victoria Regina'; films: 'The Sin of Madelon Claudet', 'Arrowsmith'); married Charles MacArthur 1928.

Hayes, Lucy Webb (1831-89), wife of President Hayes W-92

Hayes, Patrick Joseph, Cardinal (1867-1933), Roman Catholic prelate, born New York City; president Cathedral College, New York City, 1903-14; appointed Catholic chaplain bishop for U. S. Army and Navy, 1917, and Archbishop of New York, 1919; created cardinal, 1924.

Hayes, Roland (born 1887), American Negro tenor, born Curryville, Ga.; made successful concert tours in U. S. and Europe; noted for singing of Negro spirituals; sang with Boston New York, and other leading symphonies; Spingarn medal 1925

Hayes, Rutherford Birchard (1822-93), 19th president of U. S. H-250-3 administration (1877-81) H-251-8 Arrears of Pensions Bill H-253 Bland-Allison Act H-252 Chinese immigration treaty A-S13, I-24 civil service reform H-251 Greenback party H-252 reconstruction ended C-257, H-251 resumption of specie payments H-251, 252, M-220b Civil War service H-250 election dispute H-250-1, L-208 wife W-92

Hayes River, Manitoba, Canada, rises near Lake Winnipeg and flows 300 mi. to Hudson Bay, map C-50b-c

Hay fever, catarrhal affection of mucous membranes of eyes, nose, mouth, and bronchi recurring annually in late summer months; caused by pollen of various plants, such as ragweed, and affecting only individuals sensitive to these pollens. Name used also for sensitivity to plant and animal proteins other than pollens.

Haymarket riot, at Chicago C-198-4

Hayne, Paul Hamilton (1831-86), American poet; born Charleston, S.C.; called "the laureate of the South" ('Legends and Lyrics'; 'The Mountain of the Lovers').

Hayne, Robert Young (1791-1839), American statesman, born South Carolina; ardent nullification advocate; best remembered as having elicited, 1830, Webster's 'Reply to Hayne'

Webster-Hayne debate J-179, W-62

Haynes, Elwood (1857-1923), American inventor, born Portland, Ind. A-388

Haynes-Apperson "horseless carriage", picture A-389

Hay-Pauncefote (*pgns'fōt*) Treaty, negotiated 1901 between U.S. and Great Britain; abrogated Clayton-Bulwer Treaty and provided for

- construction of Panama Canal by U.S. and its permanent neutralization: M-16
Wilson and W-108
- Hays, Arthur Garfield** (born 1881), American lawyer and writer, born Rochester, N. Y.; began practise New York City 1905; active in many civil liberties cases; famous cases include *Scopes* and *Sacco-Vanzetti* ('Enemy Property in America'; 'Let Freedom Ring'; 'Democracy Works').
- Hays, Charles Melville** (1856-1912), American railroad official, born Rock Island, Ill.; began railroading at 17; served with several companies becoming president Grand Trunk Railway Co. of Canada 1910; died in *Titanic* disaster.
- Hays, Will H.** (born 1879), American lawyer, born Sullivan, Ind.; appointed postmaster general by President Harding March 1921; resigned March 1922 to become national director of motion-picture industry.
- Haywood, William Dudley** (1869-1928), American labor agitator, born Salt Lake City, Utah; 1896 joined Western Federation of Miners; founded Industrial Workers of the World (I.W.W.) in Chicago in 1905; went to Soviet Russia in 1921; L-44a
- Hazaras** (*hūz-ā-rās'*), Afghan tribe of Mongolian origin A-29
- Hazard**, in golf G-116
- Haze**, an atmospheric condition caused by suspension of fine particles in the air, making it less clear. Unlike fog, which depends on moisture, haze is often present when atmosphere is dry.
- Hazel**, bushy shrub related to the birches H-253
- Hazeltine, Louis A.**, American inventor R-27
- Hazen, Charles Downer** (1868-1941), American educator and writer, born Barnet, Vt.; professor history Smith College 1894-1914, Columbia University after 1916 ('The French Revolution and Napoleon'; 'Modern Europe'; 'Alsace-Lorraine under German Rule').
- Hazen, William Babcock** (1830-87), American general and chief signal officer, born West Hartford, Vt.; raised scientific standard of signal service; introduced and brought about adoption of cold wave signals and standard time meridians.
- Hazing**, in colleges and other schools, the infliction of indignities and severe practical jokes upon newcomers by upper-classmen; sometimes involves serious injury.
- Hazleton, Pa.**, summer resort and industrial center 20 mi. s. of Wilkes-Barre; pop. 38,009; large anthracite coal interests; makes silk, clothing, steel and iron products: map P-112
- Hazlitt, William** (1778-1830), English critic and one of greatest English essayists; whatever his theme, he derives the essence of his commentary from himself, being in turn metaphysician, moralist, humorist, painter of manners and characteristics; friend of Lamb ('Characters of Shakespeare's Plays'; 'Table Talk').
- H. D.** See in *Index* Doolittle, Hilda
- Head, Sir Edmund Walker, Baronet** (1805-68), English writer on art and colonial government; lieutenant-governor of New Brunswick 1847-54; governor general Canada 1854-61.
- Head, Sir Francis Bond, Baronet** (1793-1875), English soldier, author, and colonial governor; served in Waterloo campaign; managed gold and silver mines in South America; lieutenant governor of upper Canada 1835-37; wrote 'Bubbles from the Brunnens of Nassau'; 'Highways and Dryways'; 'Stokers and Pokers'.
- Head.** See also in *Index* Brain proportion to rest of body C-198, chart C-198
- Head, or inning**, in curling C-414
- Headband**, in bookbinding B-187
- Header**, in brick masonry B-238
- Headfish**, ocean sunfish S-330
- Head-footed mollusks**, or cephalopods M-218
- Head-hunters**
Borneo B-196, E-142c
Burma B-278a
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Formosa F-160
New Guinea N-84, picture N-83
Philippines P-166
- Headlight**, automobile A-407
- Headlock**, wrestling term, picture W-182
- Head louse**, egg, picture E-193
- Health.** See Hygiene; Public health
- Health**, goddess of (Hygieia) H-370
- Health**, god of (Apollo) H-370
- Health**, National Institute of. See in *Index* National Institute of Health
- Health Department** H-254-7. See also in *Index* Hygiene; Public health
- Health insurance** S-179
- Healy, George P. A.** (1808-94), American portrait painter, born Boston (portraits of Webster, Clay, Calhoun, and U.S. presidents from J. Q. Adams to Lincoln).
- Healy, Timothy Michael** (1855-1931), Irish leader; self-educated; through his fiery, brilliant eloquence, won many reforms for Ireland; first governor-general Irish Free State, 1922-28 ('The Great Fraud of Ulster'; 'The Planters' Progress').
- Hearing** E-126-8, S-194, 196. See also in *Index* Ear
- Hearn (hērn), Lafcadio** (1850-1904), author, famous for artistic and picturesque writing ('Chita'; 'American Miscellany'); his English books on Japan are unique in combination of truthful insight with literary art ('Kotto'; 'Glimpses of Unfamiliar Japan'; 'In Ghostly Japan'); cosmopolitan, born Ionian Islands, son of Irish army doctor and Greek mother; married Japanese and became citizen of Japan 'Japanese Fairy Tales' S-303c
- Hearne, Samuel** (1745-92), English explorer; in service with Hudson's Bay Company; discovered copper mines of Coppermine River basin in Northwest Territory and traced that river to Arctic Ocean, being first white man to reach the Arctic overland from Hudson Bay.
- Hearsay**, in law, factual evidence, the truth of which the testifying witness does not know of his own knowledge.
- Hearst, Phoebe Apperson** (1842-1919), American philanthropist, mother of William Randolph Hearst, publisher; her gifts included kindergartens, kindergarten training schools, public libraries; paid cost of architectural competition for University of California; there built and equipped Hearst Memorial Mining Building
National Congress of Mothers P-70
- Hearst, William Randolph** (born 1863), American capitalist and journalist, born San Francisco; owner of string of newspapers from San Francisco to New York and of a block of magazines; chief exponent of sensational journalism.
- Heart** H-257-9, pictograph H-258a, pictures H-258, P-205. See also in *Index* Circulation
artificial, perfected by Lindbergh L-147
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emotion affects E-262
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spider, picture S-255
- 'Heart of Midlothian'**, novel by Scott S-51
- Heart River**, North Dakota, tributary of Missouri, map N-162
- Heartsease**, another name for the pansy P-54
- Heart-wood of trees** T-131
- Heat** H-259-63, P-194, Outline P-196. See also in *Index* Heating and ventilation; Temperature
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molecular motion causes H-260, W-44, pictograph H-258b
oxyacetylene flame A-7
power produced by H-263
pyrometers measure high temperatures P-373
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resisting materials. See in *Index* Heat-resisting materials
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spectroscope measures S-275, 243
star A-344, 345
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thermometers T-78-9, H-262
transmission, methods H-261, pictograph H-258b
vacuum an insulator, picture V-268
vaporization, latent heat of W-44
waves, in physics H-262, R-14-15
- Heat engines**, machines which convert heat into mechanical energy H-263, P-194, E-266. See also in *Index* Gas engine; Steam engine

Heat exhaustion, or heat prostration, first aid for P-64-5

Heath (*hēth*), a sterile area covered by low shrubs, usually conifers and heaths; may be either excessively dry or excessively wet.

Heath, a small evergreen shrub related to heather; name often applied to heather.

Heathcoat (*hēth'kōt*), John (1783-1861), inventor, born Duffield, near Derby, England; invented important lace-making machinery.

Heathcote, Caleb (1666-1721), Colonial merchant and public official, born Derbyshire, England; came to New York in 1692; became life member of governor's council and judge of Westchester County; mayor of New York City, 1711-13; was large landowner; helped in establishing Anglicanism in Connecticut and New York.

'Heathen Chinee', poem H-232

Heather, or ling, an evergreen shrub with bell-like flowers H-263

Heath family, or Ericaceae (*ēr-i-kā-sē-ē*), a family of shrubs and trees of wide distribution including the madrona, strawberry tree, rhododendron, kalmia, bearberry, huckleberry, blueberry, cranberry, and trailing arbutus.

Heath hen, a grouse (*Tympanuchus cupido*) similar to the prairie chicken, but smaller, formerly inhabiting wooded regions of cent. and s. New England; also called eastern prairie chicken; now extinct: B-145a

Heating and ventilation H-263-6

air conditioning H-266

American colonial methods A-171, pictures A-169, 164, 172

ancient S-112, S-304

best temperature and humidity W-148, H-263-4

Boise, Idaho, natural hot-water supply I-7

central, or district heating H-265

chimneys, invention S-304

direct and indirect methods H-264

electric heating H-265, H-261

fireplaces S-304, H-263, 264; camp reflector fire C-47a; colonial A-171, pictures A-164, 169, I-103; Italian, picture I-98; modern, pictures I-105, 106; Spanish, picture I-99

fresh-air supply, average H-265, W-148

fuels P-215-17; heat efficiency of coal H-264

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hot-water heating H-264, 265

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Iceland, hot springs used I-5

infra-red rays R-14

insulating materials: asbestos A-323; bagasse (sugar-cane waste) C-343; cork C-366; gypsum G-190; terra cotta B-264

medieval castles S-112-13

oil heating P-150, picture H-265

poison gas from stoves and furnaces H-374

Pompeian baths P-300

regulation, automatic H-265; air conditioning H-266

Roman house, picture S-304

steam heating H-264

stoves S-304; Franklin A-171, S-304, picture A-172; heating efficiency H-264

thermostats H-265, T-79, picture H-265

vacuo-vapor system H-265

vacuum system H-265

vapor system H-265

vocation V-321

windows B-266, H-265-6

Heating element, of electrical apparatus A-182, picture A-181

Heat lightning L-185

Heat-resisting materials:

asbestos A-323

chromium C-283

dolomite I-145

fire brick, kinds B-255

fire glass; cooking vessels G-104;

fireproof windows G-104

graphite G-188, I-142

platinum P-245

quartz and fused quartz G-104

silica G-101, I-145; carborundum S-144

tungsten T-153

Heat stroke, or sunstroke, first aid for F-64

Heat wave, weather W-51b

Heaven, the place or state of righteous souls after death

Dante's D-12-13

Elvian Fields H-194

of Greek gods M-527

Heavenly Twins. See in Index Gemini

Heaviside, Oliver (1850-1925), British physicist; did foundation work for long-distance telephoning; suggested that there was an electrical "celling," sometimes called "Heaviside layer."

Heaviside layer. See in Index Kennelly-Heaviside layer

Heavy hydrogen C-182, H-558

Heavy oxygen C-182, A-182

Heavysege (*hēv'sē-jē*), Charles (1818-76), Canadian poet, born England; wrote 'Sam', a poetic drama original in conception and containing many passages of striking beauty.

Heavy soil S-181z

Heavy water H-188, W-48, C-189

Heavyweights, in boxing B-218-212

Hebbel, (Christian) Friedrich (1812-63), German poet and dramatist, one of greatest in 19th century; work shows skill in characterization and true feeling for dramatic situations, but is marred by occasional extravagances ('Judith'; 'Herodes and Mariamne').

Hebe (*hēbē*), in Greek mythology, cup-bearer to gods H-255

Hebenstretia (*hēb'strē-ti-ā*), a genus of South African perennial plants of the figwort family. One species (*H. comosa*) grown as annual; stems woody; flowers in 5 in. spikes, yellow or white, blotched orange-red; like mignonette; fragrant at night.

Heber, Reginald (1789-1826), English churchman and hymn writer, bishop of Calcutta ('Holy, Holy, Holy, Lord God Almighty'; 'From Greenland's Ice Mountains').

Hebe (*hēbē*), in Greek mythology, cup-bearer to gods H-255

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Hébert (5-647), Jacques René (1788-94), French revolutionist and atheist; guillotined R-117

Hébert, Louis (died 1927), Canadian colonist, born Paris, France; apothecary at French court; emigrated to Acadia 1814 where he cultivated herbs and engaged in farming and hence is known as first Canadian farmer; moved to Quebec 1817; many old French Canadian families trace their lineage to him.

Hébert, Louis Philippe (1851-1917), Canadian sculptor, noted for statues of prominent Canadians 'Evangeline', picture C-59

Hebrew language and literature H-268-7

alphabet H-268, A-183, table A-484; Geneser alphabet table A-184b

Bible B-102-3, P-353. See also in Index Bible

modern revival in Palestine P-36

Talmud H-267

Hebrews, or Jews J-215-18. See also in Index Jews

Hebrews, Epistle to the, the 18th book of the New Testament, a letter addressed to Christians of Hebrew birth, probably those living at Rome, about 55 A.D. The authorship is unknown but frequently attributed to Paul.

Hebrew University, institution of higher learning in Jerusalem on Mt. Scopus, founded mainly by the Zionist organization; opened 1925; sciences, Jewish and oriental studies, and humanities; instruction is in Hebrew language.

Hebrides (*hēb'rī-dēz*) Islands, also Western Isles, group of more than 500 islands off the w. coast of Scotland; 2812 sq. mi.; pop. 79,000; H-267, map E-270a

surrendered to Scotland T-81

Hebron (*hē'b'rōn*), one of oldest cities of Palestine, 18 mi. s. of Jerusalem; pop. 19,000

tombs of patriarchs P-84

Hecate (*hēk'ā-tē*), in Greek mythology H-268

Hec'atomb, in modern usage, the destruction of a large number of things; originally, in ancient Greece, sacrifice of 100 oxen (from *hekaton*, Greek for "hundred"); later sacrifice of any large number.

Heceta (*hē-th'ā*), Brann, 18th century Spanish explorer; discoverer of Columbia River; laid basis for Spanish claims by landing 1775 at what is now Point Grenville; O-246

Hecht, Ben (born 1894), American author, born New York City ('Erik Dorn'; 'Gargoyles'; '1001 Afternoons'; 'The Front Page', play, with Charles MacArthur).

Hecker, Isaac Thomas (1819-88), American Catholic priest, born New York City; member Brook Farm Experiment 1843; converted to Catholicism in 1844 and in 1858 founded Missionary Society of St. Paul the Apostle (Paulists).

Heckling fax F-105

Heckscher Foundation, established 1921 by gift of Mr. and Mrs. August Heckscher to promote child welfare, especially in New York State.

Hecle. See in Index Hekla

Hectare (*hēk'tēr*), a unit of measurement M-183

Hector, in Homer's 'Iliad', Trojan War hero, son of Priam, king of Troy, and Hecuba H-268-9

Priam recovers Hector's body H-269, picture A-8

Hector, Sir, knight in Arthurian legends A-315

Hecuba (*hēk'ū-bā*), in Greek mythology, wife of Priam, king of Troy H-269

dream before birth of Paris P-70

'Hedda Gabler' (*hēd'dā gāb'lēr*), play by Ibsen; its heroine is one of the most hateful and unscrupulous egoists of literature.

Hedgehog, a spiny animal H-269

hibernation H-269

Hedge nettle. See in Index Stachys

Hedges, Cornelius, early governor of Montana N-15

Hedges H-269-70, G-9

Hedging, in economics B-161.

Hedin (*hē-dēn*), Sven A. (born 1865), Swedish explorer; explored e. Turkistan, Tibet, Mongolia, and Siberia; found valuable treasures of natural science in Sinkiang prov-

- ince, China ('Through Asia'; 'Scientific Results of a Journey in Central Asia'; 'From Pole to Pole'; 'A Conquest of Tibet').
- Hedjaz.** See in *Index* **Hejaz**
- Hedley, William** (1779-1843), British inventor R-36
- He'donists**, a school of philosophers P-172
- Heel**, in anatomy human and animal F-146
Achilles' heel A-8, 9
- Heel-fly**, a bot-fly that attacks the heels of domestic animals F-129
- Heeling calves**, at the spring round-up C-109
- Heenan, John C.** (1835-73), American boxer, born West Troy, N.Y.; self-proclaimed bare-knuckle champion in 1859: B-208
- Hegel** (*hē'gēl*), Georg Wilhelm Friedrich (1770-1831), German philosopher; professor of philosophy at Heidelberg and University of Berlin; founder of the school of absolute idealism.
- Heg'enberger, Albert F.**, American aviator, *table* A-74
- Hegira** (*hēg'i-rā* or *hē-gī'rā*), Mohammed's flight from Mecca (622 A.D.), from which Moslem dates are calculated M-213-14
- Heiberg** (*hē'bērk*), Johann Ludwig (1791-1860), Danish poet and critic; edited *Flying Post*; championed Hegelian philosophy ('A Soul After Death'; 'The Newly Wedded'; 'The Nut-Cracker').
- Heidelberg** (*hē'dēl-būrg*), Germany, quaint university town on Neckar River; pop. 75,000: H-270, *map* G-66
- Heidelberg, University of, Germany** H-270, U-260
- Heidelberg College**, at Tiffin, Ohio; founded 1850 by Reformed church; arts and science, music, art, oratory, commerce, pedagogy.
- Heidelberg man** M-46
- Heidenstam** (*hē'dēn-stām*) (Karl Gustaf) Verner von (1859-1940), Swedish poet and miscellaneous writer; won Nobel prize 1916 ('Hans Alien's', fanciful epic; 'Birth of God', 'The Soothsayer', dramas; 'The Charles Men', stories of Charles XII of Sweden and his wars).
- Heifer** C-106
- Heifetz** (*hē'fēts*), Jascha (born 1901), Russian (Jewish) violinist; graduated Royal School of Music at Vilna, Poland, at age of 8; made first public appearance at 5 and before he was 18 had won recognition throughout world as master of violin; made his debut in United States in 1917.
- Height.** See also in *Index* **Altitude** growing child C-197-8, *chart* C-198 measuring groups I-71-2 racial characteristics A-221
- Height of Land**, in Canada L-72
- Heijermans** (*hē'ēr-māns*), Herman (1864-1924), Dutch writer of Jewish parentage; first became known through sketches of Jewish family life under pen name of "Samuel Falkland"; wrote several notable plays ('The Good Hope'; 'Rising Sun'; 'The Ghetto'; 'Links'; 'A Case of Arson').
- Heijo** (*hē'jō*), Korea, also Pingyang, walled city 40 mi. from w. coast; pop. 180,000; great strategic importance: *map* J-186
- Heilbronn** (*hēl'brōn*), industrial town in s. Germany on Neckar River, 25 mi. n. of Stuttgart; pop. 46,000; fine Gothic church and Rathaus.
- Heilprin** (*hēl'prin*), Angelo (1853-1907), American naturalist and traveler, born Hungary; professor invertebrate paleontology and geology, Academy of Natural Sciences, Philadelphia; made valuable investigations in Florida, Bermuda, Martinique; climbed crater of Mt. Pelée while volcano was erupting; joint editor *Lippincott's New Gazetteer*.
- Heilsberg** (*hēls'bērk*), Germany, town in e. Prussia 38 mi. s. of Königsberg; indecisive battle between French and allied Russians and Prussians 1807.
- Heimdal** (*hām-dāl*'), in Norse mythology, guardian of the rainbow bridge of the gods; can see perfectly day and night; can even hear grass grow; seldom sleeps.
- Heine** (*hē'nū*), Heinrich (1797-1856), German poet H-270-1, G-63, *picture* G-60
- Heintz'elman, Arthur William** (born 1891), American artist, born Newark, N.J.; distinguished for etchings.
- Heir** (*ēr*), from Latin word *heres*, one entitled to inherit; heir presumptive is one who will inherit if no nearer heir is born to ancestor; heir apparent is one who will inherit if he outlives ancestor, as eldest son
- heir presumptive** of England G-54
- Heisenberg** (*hē'zēn-bērk*), Werner (born 1901), German physicist; professor of theoretic physics University of Leipzig after 1927; in 1932 awarded Nobel prize in physics for work in quantum mechanics: R-16
- Hejaz** (*hēj-ās*'), or Hedjaz, part of the Kingdom of Saudi Arabia; a separate kingdom from 1919 to 1925, when it was conquered by Ibn Saud; area about 150,000 sq. mi.; pop. about 1,000,000; chief cities Mecca, Jidda, Medina: A-237, 240, *map* A-242
- Mecca** M-103
- Hek'la**, or Hecla, a volcano in s.w. Iceland; height 5100 ft.; becomes active at irregular intervals.
- Hektare** (*hēk'tēr*), unit of measurement M-130
- Hek'togram**, a unit in metric system (3.527 oz.) M-130
- Hektograph**, office appliance for reproducing letters and other documents; original writing is transferred to a moist gelatin or clay surface by use of special ink, and from this the impression is transferred to blank, dry paper; used for relatively few copies.
- Hek'toliter**, a unit in metric system (26.42 gals.) M-130
- Hek'tometer**, a unit in metric system (328 ft. 1 in.) M-130
- Hel** (*hāl*'), or Hela (*hāl'ā*), in Scandinavian mythology, goddess of death who ruled over the realm of the dead; daughter of Loki.
- Hele** (*hē'lē*), Peter, also known as Peter Henlein (1480-1542), clock maker of Nuremberg, Germany, credited with invention of first watch about 1500.
- Helen**, of Troy, in Homer's 'Iliad', most beautiful woman in Greece, daughter of Zeus and wife of Menelaus, king of Sparta; cause of Trojan War: T-142, 144
- Helena** (*hēl'ē-nā*), Saint (247?-327?), mother of Constantine the Great; legendary discoverer of the Holy Cross; festival August 18 tomb E-332, *picture* E-335
- Helena**, in Shakespeare's 'Midsummer Night's Dream', in love with Demetrius M-162
- Helena, Ark.**, shipping point on Mississippi River, 70 mi. below Memphis, Tenn.; pop. 8546; lumber, and lumber products, cottonseed-oil; scene of Federal victory July 4, 1863: *map* A-296
- Helena, Mont.**, cap., in s.w. 48 mi. n.e. of Butte; pop. 15,056; in mining and stock-raising district: M-246, *map* M-243
- capitol building**, *picture* M-245
- early settlement** M-243
- Helenium** (*hē-lē'nī-ūm*), or sneezeweed, a genus of plants of the composite family, native to N. and S. America. Rough, erect plants; leaves dotted with tiny glands; flowers daisy-like, yellow or brown ray florets notched at outer margins. Plants have been used locally in medicinal preparations.
- Helgoland** (*hēl'gō-lānt*), or Heligoland, German island in North Sea; area, about 100 acres; pop. 2500: H-271
- He'liades**, in Greek mythology, daughters of Helios P-157
- Helianthemum** (*hē-lī-ān'thē-mūm*), or sun-rose, a genus of plants, chiefly shrubs of the rock-rose family, native to Mediterranean and N. America. Branching, with evergreen or half-evergreen foliage; flowers in clusters, white, yellow, or pink; used in rock gardens
- Helianthus**, sunflower genus of plants S-331
- Helichrysum** (*hēl-i-kri'sūm*), a genus of annual and perennial plants of the composite family, native to Africa and Australia. One species (*H. bracteatum*) is grown as an everlasting; plants about 2 feet high; flower heads daisy-like, white through purple, dry and stiff, hence called "strawflowers."
- Helicon** (*hēl'i-kōn*), ancient name of a peak or mountain range in Boeotia, Greece; on the e. slope were a grove and temple sacred to the Muses: P-101
- Helicon**, brass wind-instrument resembling French horn, *picture* M-322
- Heliconius burneyi**, a South American butterfly, *color plate* I-87a-b
- Helicopter** (*hēl-i-kōptēr*), flying machine supported solely by thrust from revolving screw, or propeller, mounted on a vertical axis: A-86, *picture* A-86
- Heligoland.** See in *Index* **Helgoland**
- Hel'iodor**, yellow beryl used as gem.
- Hellogabalus** (*hē-lī-ō-gāb'ā-lūs*), or Elagabalus (205-222 A.D.), dissolute Roman emperor, proclaimed 218 A.D.; introduced into Rome worship of Syrian sun-god whose namesake and high priest he was; assassinated.
- Hel'iograph**, a sunlight reflector used in signaling: T-30, *picture* T-31
- Helioiphila** (*hē-lī-ō'fī-lā*). See in *Index* **Cape stock**
- Hellip'olis**, ancient city at head of Nile delta, Egypt; once seat of sun-worship; also ancient name of Baalbek, Syria: *maps* B-8, E-197
- Heliopsis** (*hē-lī-ōp'sis*), a genus of sunflower-like perennials of the composite family, native to N. America. Has become a weed in some places. Leaves, stems usually rough; flowers showy, yellow. Rough oxeye is *H. scabra*; hardy sunflower, false sunflower, or oxeye is *H. helianthoides*.

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cāre, būt, ryde, fūll, bārn:

He'lios, in Greek mythology, sun-god P-157
 Circe daughter of C-237
 Colossus of Rhodes S-82, *picture* S-83

Heliother'apy. See in *Index* Light therapy

He'liotrope, a flowering plant H-271
Heliotrope, or bloodstone, a semi-precious stone G-28, 25

Heliotrope, garden. See in *Index* Valerian

Heliotrope, winter. See in *Index* Winter heliotrope

Heliotropism, the tendency to turn toward or away from light plants P-241-2; compass plant C-327; heliotrope H-271

Helipterum (*hē-lip'tēr-ūm*), a genus of plants of the composite family, native to Australia and S. Africa; with the genus *Helichrysum*, this makes the largest group of everlasting flowers; includes the acroclinium and rhodanthe or Swan River everlasting.

He'lium, a gaseous element H-271, C-174, C-168

air contains A-61
 atomic structure A-361, *diagram* A-361

atomic weight C-169
 balloons filled with H-271, B-26
 chemical inertness C-170, 167b
 discovered by spectroscopy S-242
 electric signs employ E-238
 lightness, comparative G-18
 liquefied H-271
 radioactivity evolves R-33

Hell

Dante's D-12
 Greek Hades H-194. See also in *Index* Hades

Milton's 'Paradise Lost' M-179

Hel'ias, originally a small district in Thessaly ruled by Peleus, father of Achilles; later applied vaguely to all ancient Greece.

Hellbender, a salamander S-12

Hell-diver, the pied-billed grebe, or dab-chick G-151, *pictures* B-127, *color plate* B-133

Hel'lebre, black. See in *Index* Christmas rose

Hellebore, white, a plant of the lily family, genus *Veratrum*, with very poisonous roots used as spray S-262

Hellen, mythical founder of the Greeks, son of Deucalion and Pyrrha, father of Dorus (from whom came Dorians), and grandfather of Ion (Ionians) and Achaeus (Achaeans); myth probably first current about 8th century B.C., when feeling of national unity developed among Greeks.

Hellenes (*hēl'ēnz*), ancient Greeks G-156

Hellenic languages P-171

Hellenistic age G-161

at Alexandria A-116

literature G-174

Heller (*hēl'ēr*), Stephen (1814-88), Hungarian composer and pianist, born Budapest; his teaching studies widely used.

Heller, a former minor coin of Germany and Austria, 1/100 crown; also used in Czechoslovakia as 1/100 krone.

Helleri, a fish, *color plate* A-233a-b

Hel'lespont, ancient name for Dardanelles D-15, *map* A-25

Hero and Leander H-287

Xerxes' bridge of boats P-135-6. See also in *Index* Dardanelles

Hell Gate, rocky narrow part of East River, New York City N-124
 bridge. *picture* B-240b, *table* B-342

Hellman, Lillian (born 1905), playwright, born New Orleans, La.; writer since 1925; characters in 'The Children's Hour' and 'The Little Foxes' selfish and cruel; 'Watch on the Rhine' concerned with an anti-fascist German.

Hellriegel (*hēl'rē-gēl*), Herman (1831-95), German agricultural chemist; demonstrated ability of leguminous plants to assimilate free nitrogen of the air.

Hell's Canyon, in the Snake River valley between the Wallowa Mts. of Oregon on the west and the Seven Devils Range of Idaho on the east; depth below the plateau 5633 ft.

Helmer, Nora, heroine of Ibsen's 'A Doll's House'.

Helmet A-304, *pictures* A-304, 305, F-28

Helmeted, or hooded basilisk, a lizard L-170-1, I-11

Helmet shell S-108

Helmholtz, Hermann von (1821-94), German physicist, physiologist, and mathematician; invented ophthalmoscope; eminent in nearly every branch of science

sound experiments S-197
 sun's heat explained by S-328

Helmont, Jan Baptista van (1577-1644), Belgian chemist and physician; supposedly first to use term "gas"; distinguished several kinds of gases; first to adopt melting point of ice and boiling point of water as standards of temperature measurements; believed water the basic substance; also held many mystical beliefs ('*Ortus Medicinæ*').

Hel'oderm, a poisonous lizard L-171

Héloïse (*ā-lō-ē'*) (1101?-64), talented French abbess, celebrated for her devotion to Abelard A-3
 'Héloïse, The New', novel by Rousseau R-160

Hel'otism, in botany, enslavement of one plant by another L-122

He'lots, Spartan serfs S-239

Helsingborg, Sweden. See in *Index* Hälsingborg

Helsingfors, Finland. See in *Index* Helsinki

Helsingör (*hēl-sing-ūr*), also **Elsinore**, Denmark, seaport on n.e. coast of island Zealand; pop. 17,000; shipbuilding, commerce; scene of Shakespeare's 'Hamlet': C-356, *map* D-53

Helsinki (*hēl'sēn-kē*), Swedish **Helsingfors**, Finland, largest city and cap.; pop. 280,000; on Gulf of Finland; protected by fortress of Sveaborg; paper, tobacco, carpets, machinery; publishing center; university: *map* E-326e

Helvetic (*hēl-vē'shān*), or **Helvet'ic**, Republic, Swiss republic formed by French 1798; lasted until recognition of Swiss independence by Congress of Vienna, 1814.

Helvetil (*hēl-vē'shī-i*), Celtic tribe whose native home was the present s.w. Germany; later they inhabited what is now w. Switzerland; Caesar defeated them 53 B.C.

Helve'tius, Claude Adrien (1715-71), French encyclopedist and utilitarian philosopher; his most famous book, 'De l'esprit' (Of the Spirit), raised a storm; was condemned by the Sorbonne, and publicly burned.

Hemans (*hēm'ānz*), Felicia Dorothea (1793-1835), English poet whose sentimental lyrics include 'The Landing of the Pilgrim Fathers' and 'Casabianca'.

Hem'atin, in blood B-157a

Hem'atite, most important iron ore (ferric oxide Fe₂O₃) I-135
 gem, crystals form G-28
 United States deposits: Alabama B-146-7; Minnesota M-192

Hematox'ylin, the coloring matter of logwood L-181

Hemerocallis (*hēm-ēr-ō-kāl'is*). See in *Index* Day lily

Hemingway, Ernest (born 1898), American author, born Oak Park, Ill.; lived many years in Paris; served in ambulance unit and in Italian infantry in 1st World War; covered Spanish Civil War as correspondent (1937-38); writes in bald style, reporting story through externals ('The Sun Also Rises'; 'Men Without Women'; 'Farewell to Arms'; 'For Whom the Bell Tolls'); A-181, *picture* A-182

Hemiptera, name of order sometimes used to include all insects having sucking mouth parts, piercing beaks, and incomplete metamorphosis; these insects now usually classed in three orders: *Hemiptera*, the water-bugs, chinch bugs, bed-bugs, etc.; *Homoptera*, the cicadas, aphids, scale insects, etc.; and *Anoplura* or *Siphunculata*, the true lice. See also in *Index* Bugs

Hem'isphere, of brain B-223

Hemisphere, of earth, half of the globe, the earth being considered as divided at the equator into Northern and Southern Hemispheres or at some point between Europe and America (usually the 20th meridian) into Eastern and Western Hemispheres

Northern Hemisphere, *map* A-90
 seasons in, *diagram* E-133

Hem'lock, an evergreen cone-bearing tree with flat, blunt needles H-271-2
 amount cut annually U-194
 bark used in tanning L-84
 used for hedges H-270

Hemlock, poison, a plant of the parsley family, with spotted stem and small white flowers H-272, S-189

Hemlock, water, a tall poisonous plant of the parsley family P-274

Hemlock spruce. See in *Index* Western hemlock

Hemming S-88, 89, *diagrams* S-88, 90

Hemoglobin (*hēm-ō-glō'bīn*), the coloring matter of red corpuscles of blood B-157a, B-110

Hémon (*ā-mōn'*), Louis (1880-1913), French author, born Brest; went to Canada; worked on French-Canadian farm where 'Maria Chapdelaine', masterpiece of French-Canadian literature, was written.

Hemophilia (*hēm-ō-fī'lī-ā*), a blood disease B-158

Hemorrhage (*hēm-ō-rāg*), violent bleeding

how to stop F-62-3

vitamin P controls V-311a

Hemp H-272-3

cellulose source, *chart* C-123

drying fiber, *picture* T-70

harvesting, *pictures* H-273

hashish N-12

manila hemp P-168-9, H-272, *picture* R-154; cellulose source, *chart* C-123; rope and twine from

R-153-5; scientific name B-37

rope and twine R-153-5

shoe soles, *picture* S-231a

sisal H-272, S-154

Hem'pel, Frieda (born 1885), American coloratura soprano, born Leipzig, Germany; début 1905 at Berlin; with Metropolitan Opera Company, New York City, after 1912 (Gilda in 'Rigoletto'; Mimi in 'La Bohème'; Marguerite in 'Faust').

Hempstead, N.Y., residential suburb of New York City on Long Island; pop. 20,856.

Hen, domestic fowl P-336-9. *See also in Index* Poultry

Hen, sage, a large grouse G-181

Hen-and-chickens. *See in Index* Live-forever

Henbane, a poisonous plant (*Hyoscyamus niger*) of the nightshade family, *picture* P-273

Henderson, Arthur (1863-1935), British Labor leader; advocate of labor internationalism; foreign secretary 1929-31; received Nobel peace prize for 1934.

Henderson, Keith (born 1883), English painter and illustrator; author and illustrator of 'Letters to Helen' and 'Prehistoric Man'.

Henderson, Leon (born 1895), economist and public official, born Millville, N. J.; consulting economist for WPA 1936-38; member Securities and Exchange Commission, 1939; price administrator in national defense program; director, Division of Civilian Supply 1941; head of the Office of Price Administration April 1941-December 1942: N-12p

Henderson, Richard (1734-1785), American pioneer, born Hanover County, Virginia; head of Transylvania Land Company which by treaty with Cherokee Indians acquired half of state of Kentucky; organized government there with himself as president, but treaty was annulled by Virginia.

Henderson, Ky., port on Ohio River 10 mi. below Evansville, Ind., in agricultural and coal region; pop. 13,160; tobacco market; textiles, brick and tile, boxes: *map* K-11

Hendricks, Thomas Andrews (1819-85), Indiana congressman, senator, and governor; born near Zanesville, Ohio

vice-president of U.S., *table* V-392

Hendrickson, Cornelis, Dutch explorer D-40

Hendrix College, at Conway, Ark.; founded 1884 by Methodist Episcopal church; arts and sciences.

Henequen (*hén'è-kèn*), a species of the agave plant S-154

Hen'gist and Hor'sa, chieftains of first Saxon settlers (449? A.D.) in England; regarded by some authorities as legendary characters.

Henham, Ernest George. *See in Index* Trevena, John

Hen-hawks, or chicken-hawks H-245, 246

Henlein (*hén'lín*), Konrad (born 1898), Austrian-born leader of Sudeten German party in Czechoslovakia; worked for autonomy, and later transference to Germany, of Sudeten German region: C-421

Henlein, Peter. *See in Index* Hele, Peter

Henley, William Ernest (1849-1903), British poet, author of 'Invictus', ending with the unforgettable lines: "I am the master of my fate, I am the captain of my soul".

Henley-on-Thames, England, town 36 mi. w. of London, famous for its beautiful situation and its annual regattas; pop. 7000.

Henlo'pen, Cape, e. coast of Delaware D-40, *map* D-40

Henna, a small shrub (*Lawsonia inermis*) of the loosestrife family, cultivated in India, Arabia, and Egypt; leaves yield an orange dye used in coloring hair and leather, and as a cosmetic among many Orientals; the sweet-scented flowers

are used in perfumery and embalming; also called Egyptian privet, Jamaica mignonette, and reseda.

Hennepin (*én-pân*), Louis (1640?-1706?), French missionary and explorer H-274

Hennepin Canal (*hén'è-pîn*), or Illinois and Mississippi Canal, in Illinois; connects Illinois and Mississippi rivers, by way of Rock River; extends from Great Bend to Rock Island; completed 1908.

Henner (*è-nêr*), Jean Jacques (1829-1905), French painter, called "Modern Correggio" because of delicate shading used in painting nude figures in hazy landscape settings.

Hen pigeon, or Maltese pigeon, *picture* P-216

Henri (*hén'ri*), Robert (1865-1929), American painter; born Cincinnati; work includes portraits, figures, and some landscapes; highly individual and vital

portrait of Indian girl, *picture* P-27

Henrietta cloth, a light-weight wool dress fabric similar to cashmere, but more lustrous in finish; originally made with silk warp; named in honor of Henrietta Maria.

Henrietta Maria (1609-66), French princess, queen of Charles I of England; state of Maryland was named for her: C-117

Henríquez (*én-ré'kés*), Doña Salomé Ureña (1850-97), poet and educator of Dominican Republic L-67v

Henry I, "the Fowler" (876-936), Holy Roman emperor H-274

feudal power M-159-60

Henry II (972?-1024), emperor; commemorated as saint July 15: H-274

Henry III (1017-56), emperor H-274

deposes Gregory VI G-177

Leo IX and L-98

Henry IV (1050-1106), emperor

H-274-5

investiture conflict G-177

Henry V (1081-1125), emperor H-275

Henry VI (1165-97), emperor H-275

Henry VII (1262-1313), emperor

H-275

Henry I (1068-1135), king of Eng-

land H-275

son of William the Conqueror

W-101-2

town charters granted D-46

Henry II (1133-89), England

H-275-6

Becket, Thomas B-72

burial place N-149

conquers Ireland I-126

conspiracy of his sons J-222, H-276

contest for crown S-284

law reforms H-275: jury system ex-

tended J-231

Henry III (1207-72), England H-276

Simon de Montfort and the Barons'

Wars M-248-9

Henry IV (1367-1413), England

H-276

Lancastrian line founded L-59

overthrows Richard II R-104

revolt of Wales W-3

Henry V (1387-1422), England H-276

at Agincourt, *picture* H-277

Hundred Years' War H-358, A-46

Henry VI (1421-71), England

H-276-7

founds Eton College W-114

Hundred Years' War H-358

Wars of the Roses R-156

Henry VII (1457-1509), England

H-277, T-149

aids John Cabot C-9-10

chapel in Westminster Abbey W-73,

L-188

England in time of E-271, H-277

gold sovereign, *picture* M-220a

Sir Thomas More M-257

Star Chamber S-276

Wales progressed under W-2

Henry VIII (1491-1547), England

H-277-8

Anne Boleyn B-167

"Great Bible" B-103, *picture* B-104

Holbein H-319

Sir Thomas More M-257

Wolsey W-129-30

Henry I (1011-60), king of France

H-278

Henry II (1519-59), France H-278

furniture of period I-99-100

Henry III (1551-89), France H-278-9

furniture of period I-100

Henry IV (1553-1610), France, called

Henry of Navarre H-279

American exploration A-145-6;

Maine M-40

Edict of Nantes (1598) H-354,

H-279

furniture of reign I-100

starts Bourbon rule B-207

Henry, of Blois (*blwä*) (1101-71),

bishop of Winchester and papal

legate, brother of King Stephen;

quarreled with latter upon refusal

of primacy and for a time sup-

ported Matilda's claims to throne.

Henry, of Navarre. *See in Index*

Henry IV, king of France

Henry, the Lion (1129-95), duke of

Saxony and Bavaria, son of Henry,

the Proud; son-in-law of Henry II

of England; by series of wars ex-

tended power of his duchies in face

of opposition of Hohenstaufen em-

perors: G-182

Henry, the Navigator (1394-1460)

H-280-1

Columbus influenced by C-316

Portuguese empire extended P-314

tomb P-313-14

Henry, the Proud (1108?-39), duke

of Saxony and Bavaria; died fight-

ing to hold his duchies against

Conrad III whose enmity he had

earned by participating in a war

against the Hohenstaufens.

Henry Fitz Henry (1155-83), second

son of Henry II, and subsequently

heir to English throne; intrigued

against father and died warring

against brother Richard; cele-

brated for knightly exploits.

Henry, Alexander (1739-1824), Can-

adian fur-trader, traveled between

Montreal and Rockies

'Travels and Adventures' C-65

Henry, Andrew (1775?-1833), Amer-

ican trapper, born York County,

Pa.; one of founders of Missouri

Fur Company (1808-9); undaunted

by Blackfeet attacks, explored and

trapped on upper Missouri and

built Ft. Henry near mouth of

Snake River; joined Ashley in

Rocky Mountain Fur Company

(1822); directed trapping near

mouth of Yellowstone and in Green

Valley (1822-24); won frontier

renown for heroism.

Henry, Sir Edward (1850-1931), Eng-

lish police official, originated filing

system of finger-prints F-43

Henry, John. *See in Index* John

Henry

Henry, Joseph (1797-1878), Ameri-

can physicist, born Albany, N.Y.;

developed methods for weather

forecasting

discoveries: electromagnetic induc-

tion E-228, 232, *picture* I-115;

oscillatory nature of Leyden jar

discharges R-26

Henry, O., pen name of William Syd-

ney Porter (1862-1910), American

short-story writer P-305-6

Henry, Patrick (1736-99), American

Key—cäpe, ät, fär, fäst, whät, fäll; mä, yét, fêrn, thêre; ice, bít; rōw, wón, fór, nôt, dō; cäre, bútt, ryde, füll, búrn;

- Revolutionary orator and political leader H-279-80, *picture* H-280
George Rogers Clark and C-259
national monument project N-22c
St. John's Church, *picture* V-308a
- Henry, Cape, a point of land at entrance to Chesapeake Bay S-22
- Henry, the unit of electric inductance E-230
- Henry E. Huntington Library and Art Gallery, San Marino, Calif., given to the public by Henry E. Huntington in 1927; contains a fine collection of English 18th-century, early Italian and Flemish paintings, and other objects of art; also rare books and manuscripts in fields of history and literature: L-106j
- 'Henry Esmond', novel by Thackeray E-72, 73
- Henryetta, Okla., city 55 mi. s. of Tulsa in rich coal-mining district; abundance of fuel gas; zinc smelters; large glass factory; pop. 6905.
- Henry Street Settlement, social settlement in New York City; founded 1893 by Lillian D. Wald.
- Henschel, Sir George (1850-1934), English musical director, composer and singer, born Breslau, Germany; first conductor of Boston Symphony Orchestra 1881-84; founder and conductor of London Symphony Orchestra 1884-95 ('Stabat Mater', an oratorio; 'Nubia', opera; 'A Sea Change', comic opera).
- Henschke, Alfred. *See in Index* Kla-bund
- Henslowe, Philip (died 1616), English theatrical manager in whose theaters plays by famous Elizabethan dramatists were produced S-95-6
- Henson, Josiah (1787-1883), American Negro clergyman; his life furnished basis for 'Uncle Tom's Cabin': S-304
- Henson, Matthew A., Negro who accompanied Rear Admiral Peary to North Pole P-98, *picture* P-282
- Henson, William Samuel, English inventor, experimented with gliders and airplanes
steam carriage, *picture* A-66
- Hen'ty, George Alfred (1832-1902), English author, soldier, and war correspondent; writer of boys' adventure stories, clean and exciting but not of great literary merit; of his 80-odd books some of the best are 'In Freedom's Cause'; 'Under Drake's Flag'; 'In Times of Peril'; 'The Lion of the North'.
- Hepat'ica, or liverleaf, a plant of the crowfoot family, with liver-shaped leaves H-281
- Hepaticae (*hē-pāt'i-sē*), a class of primitive plants, including liverworts, *Outline* B-205
- Hepat'ic artery L-165
- Hepburn, William Peters (1833-1916), American politician, born Wellsville, Ohio; served 11 terms as Republican congressman from Iowa; author of Hepburn law.
- Hepburn law R-151
- Hephaestus (*hē-fēs-tūs*), in Greek mythology, god of fire H-281, *picture* M-326
- Aphrodite wife of A-227
armor of Achilles A-8-9
temple A-355
- Hepplewhite, George (died 1786), English furniture maker, whose delicate graceful chairs were lighter and smaller than Chippendale's and had typically straight slender legs; his pieces were characterized by simplicity and refined elegance
furniture I-104, *picture* I-101
- Heptam'eron (Greek "seven days"), collection of short stories made by various writers at court of Marguerite of Valois (or Navarre); imitative of Boccaccio's 'Decameron'; important in history of French literature.
- Heptane, in chemistry. *See in Index* Paraffin series
- Heptarchy (*hēp'tār-kī*), Greek word meaning "seven kingdoms" applied to seven divisions of England under Angles and Saxons—Kent, Sussex, Wessex, Essex, Northumberland, East Anglia and Mercia. The term is misleading, as the number of kingdoms varied from time to time.
- Heptateuch (*hēp'tā-tūk*), the first seven books of the Old Testament.
- Hera (*hēr'ā*), in Greek mythology, queen of the gods, wife of Zeus, identified with Roman goddess Juno H-281, U-261, *picture* M-326
- Callisto and C-347
cow sacred to C-102
hostile to Hercules H-282
jealous of Io I-118
judgment of Paris T-142
- Heracl'ea, battle of (280 B.C.) P-374
- Heracl'ea Pon'tica, ancient town in Asia Minor. *See in Index* Eregli
- Heracl'ea (*hēr'ā-klēz*). *See in Index* Hercules
- Heraclitus (*hēr'ā-kli'tūs*) (540?-475? B.C.), Greek philosopher, called founder of metaphysics; taught that constant change from being to not-being is fundamental principle of universe; sometimes called the Weeping Philosopher.
- Heraclius (*hēr-rā-kli'ūs*) (575-641), Byzantine emperor, son of one of Emperor Maurice's generals; killed Emperor Phocas to avenge death of Maurice and became emperor 610; saved empire from Persians who had conquered Syria during reign of Phocas.
- Herakleion (*hēr-rāk'li-ōn*), Érakleion, or Candia, seaport, largest city, and former cap. of Crete, on n. shore; pop. 43,000: C-394, *maps* E-326e, B-18
- Her'akles. *See in Index* Hercules
- Herald, court chronicler of Middle Ages H-281
- Heraldry, science of armorial bearings H-281
flags, rules F-85
- Herat (*hēr-rāt'*), fortified city in n.w. Afghanistan in province of same name; of strategic importance; pop. about 50,000; caravan center; once capital of Timur's empire: *map* A-31
- Herbarium Z-226
- Herbart (*hēr'bärt*), Johann Friedrich (1776-1841), German philosopher, psychologist, and educator; influenced by Fichte and Pestalozzi; occupied chair of philosophy at Königsberg 1809-33; contributed to development of psychology and pedagogics ('Psychology as Knowledge'; 'Psychology').
- Herbert, George (1593-1633), English poet, saintly pastor of Bemerton. 'The Temple' is full of quaint artificialities but contains some of the most treasured English sacred lyrics.
- Herbert, Victor (1859-1924), American composer and musical director, born Dublin; grandson of Samuel Lover, the poet and novelist; composed many comic operas, including 'The Red Mill', 'Naughty Marietta', 'Sweethearts'. 'Mlle. Modiste', 'Babes in Toyland'.
- Herbiv'orous animals, those that feed on plants
stomach R-176-7
tongue structure T-107
- Herb Robert, flowering plant G-60
- Herbs, plants without woody stems in which the stems and foliage die to the ground in winter; such plants are often called herbaceous; herbs may be annual, biennial, or perennial. The term herb is especially applied to those herbaceous plants used medicinally, as vegetables, or for flavoring and garnishing
flavoring herbs S-251: mint M-195-6
- Herculaneum (*hēr-kū-lā'nē-ūm*), ancient Roman city near Mt. Vesuvius, buried with Pompeii 79 A.D.
excavations P-301-2
- Hercules (*hēr'kū-lēz*), or Heracles, hero in Greek and Roman mythology H-282-3
- 'Farnese Hercules', *picture* S-55
- Hebe, wife of H-266
- Olympic games founded by O-224
- Hercules, constellation A-346, C-347, *charts* S-275d, h
- Hercules, Pillars of. *See in Index* Pillars of Hercules
- Hercules-beetle B-85, *picture* B-81
- Herder (*hēr'dēr*), Johann Gottfried von (1744-1803), German critic, philosopher, and poet: 'Kritische Wälder' (Critical Forests); 'Ideen zur Philosophie der Geschichte' (The Philosophy of History)
influence on German literature G-110, G-62-3
- Heredia (*ā-rā-dē-ū'*), José de (1842-1905), French poet, born Cuba; modern master of French sonnet.
- Heredia, José Maria (1803-39), Cuban poet, cousin of above L-67v, *picture* L-67t
- Hered'ity, transmission of qualities from parents to offspring H-283-6, B-115. *See also in Index* Breeding; Evolution; Plant improvement
cell chromatin H-283-4, B-112, C-122, *pictures* H-285, B-113
colchicine influences in plants P-245f
color, *pictographs* H-283a-b
environment modifies H-286, E-162-3
eugenics E-315
feeble-mindedness due to M-118
Galton's law of regression B-118
genes, function H-284
Mendel's laws H-284, 286, *pictographs* H-283a-b
relation to sociology S-184
'reversion to type': goldfish G-115; pigeons P-216
social heritage E-163-4
Zola's novels deal with Z-218
- Hereford (*hēr'ē-fōrd*), England, county town of Herefordshire, 120 mi. n.w. of London; 11th century cathedral; pop. 23,000: *map* E-270a
- Hereford, breed of cattle, commonly red with white markings C-104-5, *pictures* C-101, 105, A-52, I-119a
brought to U.S. A-53
- Herefordshire, inland county in s.w. England on Wales border; 842 sq. mi.; pop. 112,000; cap. Hereford.
- "Here lies one whose name was writ in water" K-9
- "Here's a ball," game P-256
- Her'esy, teaching opposed to established religion or religious authority. *See also in Index* Arianism; Inquisition; Reformation
- Abelard A-3
- Albigenses, Philip's crusade P-162
- Huss burned for H-363
- Savonarola burned as heretic S-33
- Waldenses massacred for F-186
- Wyclif W-191
- Hereward (*hēr'ē-wērd*) (11th century), English patriot outlaw; led

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

- Saxon resistance until driven from fens of Ely by William the Conqueror; hero of Kingsley's 'Hereward the Wake'.
- Herford** (*hēr'fērd*), Oliver (1863-1935), American humorist, artist, and playwright, born England ('Kitten's Garden of Verses', 'Child's Primer of Natural History', 'The Florist Shop', play).
- Hergesheimer** (*hēr'gēs-hi-mēr*), Joseph (born 1880), American novelist, born Philadelphia; studied to be a painter, but turned to literature; given to psychological studies with complex social backgrounds ('The Three Black Pennys', 'Java Head', 'Cythera', 'Swords and Roses', 'Limestone Tree').
- Hering** (*hā'ring*), Ewald (1834-1918), German physiologist and psychologist; advanced theory of four colors occurring in pairs as opposed to three-color theory of Helmholtz.
- Her'kimer**, Nicholas (1715?-77), American Revolutionary War general; defeated British at Oriskany, N. Y., but was fatally wounded.
- Hermann**, or **Arminius** (17 B.C.-21 A.D.), German chieftain who destroyed a Roman army at the battle of Teutoburg Forest.
- Hermannstadt** (*hēr'män-shtät*), Rumania. See in *Index* Sibiu
- Hermaphroditism**, existence in single plant or animal of both male and female sexual characteristics, *Outline* B-117
- 'Hermas**, Shepherd of, apocryphal book of New Testament.
- Hermes** (*hēr'mēs*), in Greek mythology messenger of gods; Roman Mercury; H-286. See also in *Index* Mercury protects Odysseus C-237 slays Argus I-118 statue by Praxiteles G-166, *picture* S-55
- Hermes Trismegis'tus** ("Hermes the thrice greatest"), Greek name of Egyptian god Thoth; reputed author of Hermetic Books, encyclopedic works on Egyptian religion, art, and science.
- Her'mia**, in Shakespeare's 'Midsummer Night's Dream', daughter of Egeus, in love with Lysander M-162
- Hermione** (*hēr-mī'ō-nē*), in Shakespeare's 'Winter's Tale', wife of Leontes W-118
- Hermit** M-232
- Hermitage**, art gallery in Leningrad; since 1917 almost all other famous collections in Leningrad have been added to Hermitage collection: L-95, *picture* R-184, *table* M-392
- Hermitage**, The, home of Andrew Jackson J-180
- Hermit crab**, a type that lives in an empty mollusk shell C-388-90, *picture* C-389
- Hermit-thrush** T-88
- Hermion** (*hēr'mōn*), mountain in Syria 30 mi. s.w. of Damascus; 9400 ft.; Arabic Jebel-es-Sheikh.
- Hermop'olis**, or **Hermopolis**, Greek city on e. coast of island of Syra; capital of Cyclades; shipbuilding and commercial center; exports tobacco and emery; pop. 21,000.
- Hermopolis Parva**. See in *Index* Damanhur
- Hernández** (*ēr-nän'dēz*), José (1834-86), Argentine poet L-67s, t
- 'Hernani'** (*ēr-nā-nē*), tragedy by Victor Hugo; Count Hernani, to fulfill a pledge, ends life just as love, wealth, and high dignities are his; Verdi's opera 'Ernani' founded on tragedy: H-353
- Herdon**, Hugh, Jr., American aviator, *picture* A-73, *table* A-74
- Herndon**, William H. (1818-91), American lawyer, born in Greensburg, Ky.; mayor of Springfield, Ill.; law partner of Lincoln and author in collaboration with J. W. Weik of 'Herndon's Lincoln' and 'The True Story of a Great Life'.
- Herne**, James A. (originally James Aherne) (1840-1901), American actor and dramatist, born Cohoes, N. Y.; skillful in depiction of rural life and everyday types of character ('Shore Acres').
- Hero**, or **Heron**, of Alexandria (first century A.D.), Greek mathematician and writer invents first steam engine S-280
- Hero and Leander**, lovers in famous Greek legend H-287
- Her'od I**, the Great, king of Judea (37-34 B.C.) H-287 orders children slain B-101, J-213
- Herod Agrippa I** (10? B.C.-44 A.D.), king of Judea; acquired territory equal in extent to that of his grandfather Herod the Great; favored Jews and persecuted Christians.
- Herod Agrippa II** (27-100 A.D.), son of above; last king of family of Herod the Great; St. Paul was tried before him at Caesarea.
- Herod Antipas**, tetrarch of Galilee (4 B.C.-39 A.D.) H-287
- Herodias** (*hē-rō'di-ās*), wife of Herod Antipas, mother of Salome, and instigator of the beheading of John the Baptist H-287
- Herod'otus** (484?-425? B.C.), Greek historian, the "father of history" H-287
- 'History'** cited E-144, S-152, E-203: concerning alphabet A-135 place in Greek literature G-173
- Hero'ic couplet**, a verse form P-270 used by Dryden D-115; Pope P-303, P-270
- Heroin** (*hēr'ō-in*), a narcotic drug, an acetic salt of morphine; developed in effort to obtain non-habit forming narcotic, but turned out to be more dangerous than morphine; chief use, to allay cough poisoning, first aid for P-275
- Heroism** (*hēr'ō-izm*). See in *Index* Courage
- Her'on**, a long-necked, long-legged wading bird S-296-7. See also in *Index* Egret food of young B-128 great blue S-296, *pictures* S-296, *color plate* B-134 great white S-297, *picture* N-33 length of life, average, *pictograph* A-198 migration M-163 nest, *picture* B-127
- Heron of Alexandria**. See in *Index* Hero
- Her'onry**, nesting and breeding place of herons S-296
- Herostratus** (*hē-rōs'trā-tūs*) (4th cent. B.C.), Ephesian who set fire to Diana's temple S-82
- Héroult** (*ā-rq'*), Paul Louis Toussaint (1862?-1914), French metallurgist; discoverer of method of separating aluminum: A-138, H-201
- Herr**, German title of polite address to a man.
- Herrera** (*ār-rā'rā*), Alphonso (born 1868), Mexican biologist; director biology division, Mexican department agriculture; held all matter capable of life under proper conditions; was able to imitate living cells with inanimate substances in laboratory.
- Herrera, Fernando de** (1534-97), Spanish lyric and epic poet; foreign influence shown in his work; did much to enrich the language.
- Herrera, Francisco de** (1576-1656), called "el Viejo" (the old), Spanish painter, engraver, etcher, and architect, born Seville; noted for genre and religious paintings ('Last Judgment' in church at Seville; 'St. Basil Dictating His Doctrine' in Louvre). His son, Francisco, called "el Mozo" (the young), was painter to King Philip IV, also noted as architect.
- Herreshoff** (*hēr'ēs-hōf*), John B. (1841-1915), blind American naval architect, born Bristol, R.I.; member of a family of shipbuilders and founder of firm which designed America's Cup defenders.
- Her'rick**, Myron T. (1854-1929), American capitalist and diplomat; governor of Ohio 1903-06; U. S. ambassador to France 1912-14 and 1921-29; remained in Paris September 1914 after outbreak of World War, when French government removed to Bordeaux, taking over embassies of other countries; started rural credit movement in U. S.
- Herriek, Robert** (1591-1674), English lyric poet; 'Corinna's Maying', 'Night Piece to Julia', 'Gather Ye Rosebuds', and other delicate, exquisite, unimpassioned verse, published in volume 'Hesperides'.
- Herriek, Robert** (1868-1938), American novelist, born Cambridge, Mass.; professor at University of Chicago 1895-1923; general secretary of Virgin Islands 1935-38; novels and short stories deal with modern life; realist ('The Memoirs of an American Citizen', 'The Common Lot', 'Together', 'A Life for a Life', 'The Conscript Mother', 'Chimes', 'The End of Desire').
- Herrin**, Ill., coal-mining center in s. of state 10 mi. n.w. of Marion; pop. 9352; machine shops, foundries, powder plant.
- Herring**, a soft-finned food fish H-287, F-74 eggs, number laid O-200 fisheries F-81: Hanseatic League monopoly H-212 lake, or cisco W-85 young sold as sardines S-28
- Herring family**, or **Clupeidae** (*kly-pē'i-dē*), a family of soft-finned fishes comprising the herring, alewife, shad, sardine, and menhaden.
- Herring gull** G-186, *pictures* G-187, *color plate* B-133
- Herriot** (*ēr-ē-ō'*), Edouard (born 1872), French statesman; distinguished as scholar, man of letters, and radical politician; premier and minister of foreign affairs 1924-25, and again in 1926 and 1932; mayor of Lyons and president of the chamber of deputies ('Life and Times of Beethoven'; 'United States of Europe').
- Her'schel**, Caroline (1750-1848), English astronomer, born Germany, sister and devoted assistant of Sir William Herschel; discovered five comets.
- Herschel**, Sir John F. W. (1792-1871), English astronomer, son of Sir William Herschel; discovered 525 star clusters and nebulae not recorded by his father; made first telescopic survey of southern heavens; invented a process of photography on sensitized paper.

Key—cāpe, āt, fār, fāst, whāf, fāll; mē, yēt, fērn. thēre; īce, bīt; rōw, wōn, fōr, nōt, dē; cūre, būf, rēde, fūll, bārū;

Herschel, Sir William (1738-1822), English astronomer, born Germany; developed study of fixed stars and discovered 5000 star clusters; proved motion of solar system through space

Uranus discovered by A-349

Herschel, Sir William J. (1833-1917), British official, son of Sir J. F. W. Herschel and grandson of Sir William Herschel; inventor of system of finger-print identification.

Herschell, Farrar Herschell, first Baron (1837-99), lord chancellor of England in 1886 and again 1892-95; president of Anglo-American boundary commission 1898-99.

Hershey, Lewis B. (born 1893), army officer, born Steuben County, Ind.; War Dept. general staff 1936-40 director, Selective Service N-121

Hershey, Milton S. (born 1857), confectioner and philanthropist, born Dauphin County, Pa.; began as printer's devil on small paper; turned to candy making and built up huge chocolate industry; founded Hershey Industrial School for orphan boys, at Hershey, Pa. and 1918 transferred to it his entire wealth (estimated at \$60,000,000).

'Her Son', sculpture by Nellie Verne Walker, picture S-64a-b

Hertel, Albert (born 1871), mural painter, born New York painting by, picture U-206

Hertford College, Oxford, England O-260

Hertfordshire (här'förd-shēr), inland county in s.e. England; 632 sq. mi.; pop. 401,000; cap. Hertford; agriculture.

Herty, Charles Holmes (1867-1938), American chemist, born Milledgeville, Ga.; professor chemistry Univ. of N. C. 1905-16; editor *Journal of Industrial and Engineering Chemistry* 1917-21; spent years in research in dye, turpentine, and paper industries: P-245b-c, P-220

Hertz (hërts), Alfred (1872-1942), German-American musician, born Frankfurt; conductor in German cities; at Metropolitan Opera House, New York City, 1902-15; directed first performance of Wagner's 'Parsifal' outside of Bayreuth; director San Francisco Symphony Orchestra 1915-30; inaugurated concerts in Hollywood Bowl, Los Angeles.

Hertz, Gustav (born 1887), German physicist. See Franck, James

Hertz, Heinrich Rudolph (1857-94), German physicist, born at Hamburg; became assistant to Helmholtz at Berlin; professor of physics, Polytechnic Institute, Karlsruhe, then at University of Bonn; principal studies electrical, including "Hertzian" waves, later developed into radio: E-233, picture E-232 cathode ray studies X-199 radio ("Hertzian") waves discovered R-26-7, R-13

Hertz, Henrik (1797?-1870), Danish poet and dramatist of Jewish parentage; works show romantic feeling and color, graceful style ('King Rene's Daughter', 'Svend Dyrring House').

Hertzian waves, include electric or radio waves R-13-14, 17, 26-7

Hertzog, James Barry Munnik (1866-1942), South African statesman and general; premier and minister for native affairs 1924-39; leader of old Republican Boers; after 1924 modified his anti-British policy; delegate to British Imperial Conference 1926: S-166

Hervé Riel (ér-ré' ré-pél'), a Breton sailor, hero of a poem by Browning, who piloted the French fleet safely into St. Malo after its serious defeat by the English and Dutch off Cape La Hogue in the English Channel (1692).

Hervey Archipelago. See in Index Cook Islands

Hervieu (ér-ré-pé'), Paul E. (1857-1915), French dramatist and novelist; skilful in drawing character; dramas built on clever theatrical formulas ('Le dédalle'; produced in English as 'The Labyrinth').

Herzegovina (hër-sé-gé-ré-ná), See in Index Bosnia and Herzegovina

Herzen (hért'sén), Alexander (1812-70), Russian author and publicist, whose political writings, secretly circulated in Russia, stirred up revolt against Russian absolutism.

Herzig, August Albert Theodor (1845-1919), German sculptor 'Echo', statue, picture E-144

Herzl (hért'sl), Theodor (1860-1904), Hungarian Jew, founder of modern political Zionism, which favors autonomous settlement of Jews in Palestine.

Hesiod (hë'si-ód) (8th century B.C.), father of Greek didactic poetry G-171

Hesper, or Hesperus, name given by Greeks to evening star; the son of Eos (Aurora) in Greek mythology; at first considered to be same as Phosphor, the morning star; later believed to be his brother.

Hesperides (hës-për'i-déz), in Greek mythology, sisters, usually supposed to be four in number, symbols of love and fruitfulness; figure in stories of Cadmus, Thetis, and Atalanta

Hercules obtains apples of H-252

Hesperis (hës-për-is). See in Index Sweet rocket

Hesperus. See in Index Hesper

Hess, Alfred (1875-1938), American pediatrician and pathologist; discovered treatment for rickets: V-312

Hess, Myra (born 1890), English pianist; at age of 12 won scholarship to Royal Academy of Music; made début at Queen's Hall, London, 1907; appeared widely in Europe, and since 1922 also in U.S. and Canada; particularly famed for rendition of Bach, Mozart, and Scarlatti.

Hess, Rudolph (born 1894), deputy leader of German National Socialist party; as personal secretary to Hitler 1923-33 assisted in writing 'Mein Kampf'; Fuehrer's deputy in Reichstag after 1933; appointed Hitler's successor after Goering, 1939; flew to Scotland May 1941, landed by parachute, surrendered to British government; kept prisoner of war; his peace proposals revealed Sept 1943: V-178r

Hesse (hës), state in s.w. Germany, grand duchy until 1918; 2970 sq. mi.; pop. 1,347,000; agriculture, lumber, wine, coal and iron; makes leather, cloth, chemicals: map G-66

Hesse-Cassel (käs'el), former German landgraviate and electorate; joined Austria in Austro-Prussian War (1866); annexed by Prussia.

Hesse-Darmstadt (därm'shtät), name of Hesse until 1866.

Hesse-Nassau (nä'sou), province of Prussia, Germany; 6504 sq. mi.; pop. 2,690,000.

Hes'sian fly, a grain pest H-287 control methods A-53 fossil ancestor, picture A-140

Hessians, German soldiers hired by England during American Revolution to fight against colonists; about half were from Hesse-Cassel and Hesse-Darmstadt, hence the name

Battle of Trenton R-23

Hestia, Greek goddess of hearth and home; Roman Vestal V-293-1 daughter of Kronos U-281

Heich Hetchy Valley, California, a deep valley of the Sierra Nevada, in Yosemite National Park reservoir and aqueduct for San Francisco A-288, S-26

Heteroauxin, promotes plant growth P-245c

Heterodyning, in radio R-22

Heteropappus, a genus of aster-like plants of the composite family; perennial, low-growing, with azure-blue flowers; native to Japan and China; also called blue daisy.

Heuchera (hë'hë-rä), See in Index Alum root

He'vea brasiliensis, a rubber tree R-184

Hevesy (hë'hë-shi), Georg von (born 1858), Hungarian chemist; with D. Coster, co-discoverer of hafnium (1923).

"He was not of an age, but for all time" S-96

Hewes, Agnes Danforth (born 1878?), American author, born Syria; children's books are historical in setting ('A Boy of the Lost Crusade'; 'Spice and the Devil's Cave'; 'Swords on the Sea'; 'Glory of the Seas'; 'Codfish Musket').

Hewes, Joseph (1730-79), signer of Declaration of Independence; born Kingston, N. J. delegate to Continental Congress N-159

Hew'itt, Abram S. (1822-1903), American capitalist and political leader; man of fine public spirit and consistent advocate of good government; introduced into America open-hearth process of making steel; representative in Congress 1875-79, 1881-86; mayor of New York City 1886-90.

Hewitt, Peter Cooper (1861-1921), American inventor; son of Abram S. Hewitt and grandson of Peter Cooper; invented Cooper-Hewitt mercury vapor electric lamp and mercury vapor rectifier.

Hewlett, James Monroe (1868-1941), American architect and mural painter, born Lawrence, Long Island, N. Y.; designed Brooklyn Masonic Temple, Philadelphia War Memorial, and City Club, New York; murals in Carnegie Institute of Technology, Pittsburgh, and Columbia University Club, New York Brooklyn Bridge, mural, picture A-312

Hew'lett, Maurice Henry (1861-1923), English romantic novelist ('The Forest Lovers'; 'Richard Yea-and-Nay'; 'The Queen's Quair'; 'Open Country'; time ranging from medieval to modern, scenes from Iceland to Italy): E-288

Hexagonal crystals M-182

Hexam'eter, in poetry P-269 Longfellow used L-194

Hexane, in chemistry. See in Index Paraffin series

Hexap'oda, the class of six-legged arthropods, or insects I-87, Outline Z-229

Hexateuch (hëk'sä-tük), name given to the first six books of the Bible—Genesis, Exodus, Leviticus, Numbers, Deuteronomy, and Joshua.

Hex'ham, market town in n. England on Tyne River, 20 mi. w. of Newcastle; here Yorkists defeated Lancastrians in 1464; pop. 9000; gloves and coal.

Heydrich, Reinhard (1904-42), director, German Gestapo; "protector," Bohemia, 1941-42; assassinated Prague 1942; bloody reprisals taken by Nazis.

Heyl, Paul Renno (born 1872), American physicist, with U. S. Bureau of Standards since 1920; invented, with Dr. L. J. Briggs, earth induction compass
earth weighed by E-132

Heyse (*hi'se*), Paul (1830-1914), German poet, novelist, and short-story writer; Nobel prize winner, 1910; master of the novelette; a pessimistic but progressive, radical thinker ('Children of the World'; 'In Paradise').

Heyward, DuBose (1885-1940), American writer and lecturer, born Charleston, S. C.; pictures humor and pathos of Negro life with understanding and striking realism ('Carolina Chansons', poems; 'Porgy', novel, later dramatized with aid of wife, Dorothy; 'Mamba's Daughters', novel).

Heyward, Thomas, Jr. (1746-1809), American jurist, born St. Luke's, S. C., a signer of Declaration of Independence; representative in Continental Congress 1775-78; taken prisoner by British in Revolution.

Heywood, Thomas (died 1641?), English dramatist; claimed to have written in whole or part more than 200 plays; at his best in simple domestic drama ('A Woman Killed with Kindness').

Hezekiah (8th-7th centuries B.C.), king of Judah; reign important for two invasions of Judah by Sennacherib of Assyria (701 B.C. and about 690 B.C.); in first, Sennacherib was successful, but in second a plague in the Assyrian army saved Judah.

"H.H." See in *Index* Jackson, Helen Hunt

Hiawatha (*hi-a-wi'tha*), Iroquois reformer, statesman, and prophet; flourished about 1570; founder of the League of Iroquois and promoter of peace; picture M-193
Longfellow's poem L-194: quoted O-257, L-65

Hibbard, Frederick C. (born 1881), sculptor, born Canton, Mo.; his many sculptures include Mark Twain at Hannibal, Mo., U.S. Grant at Vicksburg, Miss., two bronze groups in Grant Park, Chicago
Tom Sawyer and Huckleberry Finn, picture T-169

Hibben, John Grier (1861-1933), American educator, born Peoria, Ill.; president Princeton University; educated at Princeton and in Berlin; Presbyterian minister four years in Chambersburg, Pa.; taught logic and psychology at Princeton 1891-1912, served as president 1912-32; author of books on logic and philosophy.

Hibben, Paxton (1880-1928), American journalist; born Indianapolis, Ind.; diplomatic service in Russia, Mexico, Colombia, Holland ('The Famine in Russia'; 'Henry Ward Beecher; an American Portrait').

Hibbing, Minn., village 60 mi. n.w. of Duluth in famous Mesabi iron ore range; pop. 16,385; largest open pit iron mine in world lies within village limits: M-194

Hiberna'tion, dormancy of animals

during the winter H-288-9. See also in *Index* Estivation

alligators A-129

bears B-67, 69, H-288

chipmunk C-222

dormouse D-87, picture H-288

earthworm E-137

fish: eels E-191

frogs F-208, H-288

groundhogs G-179, H-288-9

insects I-87: chinch bug C-222; bee B-77; wasp, picture W-35

prairie-dog P-342

skunk S-157

snakes S-173: rattlesnake R-52

toads T-101

tortoise T-166

Hibernia (*hi-ber'ni-a*), ancient Latin and poetical name of Ireland.

Hibernians, Ancient Order of, a fraternal society of Roman Catholic men of Irish birth or descent. Its history is traced back to the 17th century or earlier in Ireland; the American branch was organized in New York City in 1836. It has aided the Irish national movement and provides sick benefits, insurance, and help for its members.

Hibiscus, a large genus of herbs and shrubs of the mallow family, many of which are popularly called rose mallow; most species have large showy flowers; among the species cultivated in gardens are the rose-of-Sharon (*Hibiscus syriacus*), swamp rose mallow (*Hibiscus Moscheutos*), and flower-of-an-hour (*Hibiscus Trionum*); fruit of okra or gumbo (*Hibiscus esculentus*) used as food.

Hiccough, or hiccup, sharp sound caused by sudden arrest of breathing due to spasmodic contraction of the diaphragm and glottis.

Hich'ens, Robert Smythe (born 1864), English novelist and playwright ('Green Carnation'; 'The Garden of Allah'; 'Bella Donna').

Hickam Field, U. S. Army air field on Oahu Island, H. I., near Pearl Harbor; seriously damaged in Japanese attack of Dec. 7, 1941.

Hickok, James B. ("Wild Bill") (1837-76), American frontiersman, born Troy Grove, Ill.; stage-coach driver on Santa Fe and Oregon trails; Union scout, spy and U. S. deputy marshal during and after Civil War; fond of gambling and famed as a dead shot; town marshal of Hays City, Kan., 1869, of Abilene, Kan., 1871; killed many thieves and outlaws; murdered at Deadwood, S. D., by Jack McCall.

Hickory, N. C., city 45 mi. n.w. of Charlotte; pop. 13,487; hickory wagons made here since 1880; hosiery, cotton, and knitting mills, foundry products and furniture.

Hickory, a North American tree of the walnut family H-289-91
dye from D-121

Hickory elm, a tree E-257

Hicks, Elias (1748-1830), American minister of Society of Friends; born Hempstead, Long Island; strong advocate of abolition; because of his liberal religious views, Society divided for years into "Orthodox" and "Hicksite" Friends.

Hicks, Granville (born 1901), author, born Exeter, N.H.; editorial staff *New Masses Magazine* 1934-39; edited letters of Lincoln Steffens ('Great Tradition'; 'One of Us').

Hicks, William (1830-83), British soldier; entered service of khedive of Egypt 1882; killed when his army was wiped out as result of treachery: E-200

Hidalgo (*ē-dāl'gō*), Mexico, state in central part; 8057 sq. mi.; pop. 680,000; cap. Pachuca; mining, textile manufactures.

Hidalgo y Costilla (*ē-dāl'gō ē kōs-tē'yā*), Miguel (1753-1811), Mexican patriot priest, venerated as a saint L-67h-i

banner F-100, color plate F-90

leader of revolt M-142d

Hidari (*hē-dā-rē*) Jingorō (1594-1634), Japanese artist M-231

Hidatsa (*hē-dāt'sā*), or Minitari Indians. See in *Index* Gros Ventres

Hiddenite (*hid'n-ī*), a transparent green variety of spodumene, used as a gem; found in North Carolina.

"Hide and Seek," origin P-247-8

Hides L-83-7. See also in *Index* Furs and fur trade; Leather
Chicago industry C-187
elephant E-248

Manchurian products M-51

Hide-weed, a seaweed, picture S-72

Hideyoshi (*hē-dā-yō'shō*), Toyotomi (1536-98), Japanese warrior and statesman; son of peasant, became practical ruler of Japan as regent (1586).

Hierarchy (*hi'er-ark-ē*), a body of ecclesiastical rulers; especially applied to Roman Catholic clergy from pope to lower clergy.

Hieratic writing, a running form of Egyptian hieroglyphic writing W-184, chart W-185

Hieroglyphics (*hi'er-ō-glif'iks*), picture writing W-184, chart W-185, H-291. See also in *Index* Ideographic writing; Picture writing
Aztec, pictures A-409, 410
Egyptian, charts W-185, A-134a
Mayan Y-211

Rosetta Stone E-202-3, picture E-203

Hieronymus. See in *Index* Jerome, Saint

Higgins, Edward J. (born 1864), English Salvation Army leader, born Highbridge, Somerset; received first commission in Army at age of 18; elected commanding general 1929; resigned 1934.

Higgins, Frederick Robert (1896-1941), Irish poet, born Foxford, County Mayo, Ireland; visited U. S. in 1937 with Abbey Theatre players, for whom he was managing director; considered disciple of William Butler Yeats ('The Dark Breed'; 'Arable Holdings').

Higginson, Henry Lee (1834-1919), American banker, born New York City; major in Civil War; joined Lee, Higginson & Co., Boston bankers, 1868; founded Boston Symphony Orchestra, 1881; gave Soldiers' Field and Harvard Union to Harvard University.

Higginson, Thomas Wentworth (1823-1911), American author and Civil War soldier, born Cambridge, Mass.; colonel of first regiment of freed slaves ('Young Folks' History of the United States'; 'Cheerful Yesterdays').

High, The, street in Oxford, England, picture O-261

High alumina brick B-238

High-boy, a chest of drawers A-169, I-105, pictures I-102, A-165

High Church, that party in the Anglican and Episcopal Church which stresses sacramental religion and holds to the doctrine of apostolic succession.

Higher Criticism, applied to the Bible, a detailed study of texts to determine their dates, authorship, conditions under which they were written, and other features.

- Higher education. *See in Index* Colleges; Universities
- High frequency, electric current R-24-5
- High German, language G-60
- Highland fling, one of Scotland's animated national dances danced by three or four persons, so called because of peculiar flinging action of steps as performer dances alternately on each leg: *picture* F-132
- Highland Park, Ill., residential city on Lake Michigan 25 mi. n. of Chicago; pop. 14,476; Ravinia Park popular summer music center.
- Highland Park, Mich., automobile manufacturing city surrounded by Detroit; pop. 50,810: D-58
- Highland Park, Tex., suburb of Dallas; pop. 10,288; chiefly residential.
- Highlands, in New Jersey N-89
- Highlands, the part of Scotland n. of the Grampians: S-44, *map* E-270a costume, *picture* S-44
- Highlands of the Hudson, range of hills in s.e. N.Y., intersected by the Hudson River H-350
- High Peak, or The Peak, in Derbyshire, England; 2086 ft.; at southern end of Pennine chain.
- High Point, N.C., city 70 mi. n.e. of Charlotte; pop. 38,495; glass, paints, machinery, textiles, hosiery; High Point College furniture N-157
- High priest, Jewish, religious head of Hebrews, especially in Palestine at the time of the Temple of Solomon; guardian of the sanctuary; wore robes of great splendor. Aaron was regarded as first high priest. In post-exilic times important political powers were exercised breastplate of G-25
- High relief, or alto-rilievo, in sculpture S-52, *pictures* S-57, 59
- High rigger, in lumber camps L-218
- "Highs," in weather forecasting W-60, *picture* W-60b
- High school E-179, 183, S-40
- junior high school E-185
- libraries L-106i
- vocational guidance V-315-16
- High School Victory Corps, in 2d World War N-12i
- High seas, ocean waters 3 mi. or more from shore not included in territorial boundaries of any nation.
- High-speed tool alloys A-131, T-150
- High tension electric current, current under pressure of thousands of volts, *picture* E-219
- highest man can generate X-202
- power lines use E-235
- transformers T-119, E-229
- X-ray tubes X-201-2
- Highways R-111-16. *See also in Index* Roads and streets
- Hiiumaa (*hē'n-mä*), or Dago (*dä'gū*), island, in Baltic Sea off w. coast of Estonia, n. of Saare Island; 373 sq. mi.; pop. about 17,000; farming, fishing; settled by Teutonic Knights in 1200; taken by Sweden 1563, by Russia 1721; occupied by Germany 1917; given to Estonia 1918; leased by Estonia to U.S.S.R. for military base 1939: *map* E-326d-e
- Hiking, camper's rules C-47b
- Hilda, or Hild, Saint (614-680), English abbess, descendant of royal Northumbrian line; founded monastery of Whitby.
- Hildebrand (*hildē-brānt*) (1020-85), called Gregory VII after election to papacy G-177
- investiture conflict H-274-5, G-177
- Hildebrand, Adolf (1847-1921), German sculptor; combined naturalism with classic forms; his favorite subject was the nude male figure; also did many portrait busts ('The Problem of Form').
- Hildesheim (*hildēs-him*), Germany, industrial and trading town in province of Hanover, Prussia; 21 mi. s.e. of Hanover; fine examples late Gothic and Romanesque architecture; pop. 64,000; seat of bishopric, prominent in Middle Ages.
- Hill, Ambrose Powell (1825-65), American soldier, born Culpeper County, Va.; served in Mexican and Seminole wars; attained rank of lieutenant general in Confederate Army; led division during Seven Days, 2d Bull Run, Antietam and Fredericksburg battles; wounded at Chancellorsville; made commander of corps of Lee's army which he led at Gettysburg and in Wilderness Campaign; killed at Petersburg Harpers Ferry C-254
- Hill, Daniel Harvey (1821-89), American soldier and educator; born York District, S. C.; served gallantly in Mexican War; attained rank of lieutenant general in Confederate Army; conspicuous at Malvern Hill, South Mountain, Antietam, and Fredericksburg.
- Hill, David Jayne (1850-1932), American diplomat and historian, born Plainfield, N.J.; assistant secretary of state, 1898-1903; U. S. minister to Switzerland, Holland, and ambassador to Germany ('History of Diplomacy in the International Development of Europe').
- Hill, Edward Burlingame (born 1872), composer and teacher, born Cambridge, Mass.; at Harvard 1908-28; composed songs, sonatas, chamber music, symphonies.
- Hill, James Jerome (1838-1916), American railroad magnate H-291
- memorial library S-11
- Hill, Sir Rowland (1795-1879), English administrator, author of uniform "penny" postal system P-320, 322, S-267-8
- Hill, in physiography P-200
- Hillbilly, an American colloquialism meaning a backwoodsman or a mountaineer, especially of s. U. S.
- Hillel (70? B.C.-10? A.D.), Jewish rabbi, born Babylonia; president Sanhedrin in Jerusalem; noted for humility, gentleness, true piety.
- Hillier, Ferdinand (1811-85), German musical composer and director; friend of Mendelssohn.
- Hillis, Newell Dwight (1858-1929), American clergyman and author, born Magnolia, Iowa; Plymouth Congregational Church, Brooklyn 1899-1924 ('Building a Working Faith'; 'Studies of the Great War').
- Hillman, Sidney (born 1887), American labor leader, born Lithuania; president Amalgamated Clothing Workers of America; director of labor division of Office of Production Management (later War Production Board) 1941 to April 1942, when he was appointed adviser on labor matters to President Roosevelt.
- Hillquit, Morris (1869-1933), American lawyer and Socialist leader, born Latvia ('History of Socialism in the U. S.'; 'Socialism Summed Up'; 'From Marx to Lenin').
- Hillsdale College, at Hillsdale, Mich.; founded 1844; arts and sciences, music, home economics, business, nursery school.
- Hillside, N. J., township between Newark and Elizabeth; pop. 18,556; steel, iron, and wood products, toilet preparations.
- Hillyer, Robert S. (born 1895), poet, born East Orange, N. J.; teacher of English at Harvard after 1919; Pulitzer prize (1934); author of symbolical novel 'Riverhead'; verse in classic tradition, disciplined and thoughtful ('Collected Verse'; 'A Letter to Robert Frost and Others').
- Hilo (*hē'lō*), Hawaiian Islands, port on n.e. coast of Hawaii; pop. 23,353: H-241, *map* H-242
- anchorage H-216
- Hilton, James (born 1900), English novelist, born Leigh, Lancashire, England. In 'Good-bye, Mr. Chips', he pictures his schoolmaster father; unusual background and characterization in his 'Lost Horizon', 'Without Armour', 'Random Harvest'.
- Hi'lum, of seeds, *picture* B-66
- Himalaya (*hi-mā'la-yā*) Mountains, the loftiest mountain system on earth, between India and Tibet; 1500 mi. long; highest point 29,141 ft.: H-291-2, *maps* A-332a, b-c, I-30, *pictures* H-292, I-31
- Mt. Everest E-339-40, *picture* A-333
- plant life I-34
- Himalayan bear B-69
- Himation (*hi-māt'i-ōn*), Greek garment D-106, *picture* D-107
- Himmeler, Heinrich (born 1900), officer and politician, born Munich, Germany; joined National Socialist party 1919; 1927 became deputy leader and 1929 Reichs leader of *Schutzstaffel* (S.S.); made chief of Gestapo 1934, carried out "purge" of that year; made minister of interior and chief of Reich administration Aug. 1943: *picture* W-178h
- Hinaidi, suburb of Baghdad B-14
- Hincks, Sir Francis (1807-85), Canadian journalist, financier, and statesman, born Ireland; prime minister 1851-54; governor of Barbados 1855-62, of British Guiana 1862-69; conspicuous leader in fight for responsible government; notable work as minister of finance; promoted reciprocity with U. S.
- Hind, a female deer.
- Hindemith (*hin'dē-mīt*), Paul (born 1895), composer, born Hanau, Germany; conducted opera at Frankfurt; compositions extremely modern in style; operas, chamber and vocal music ('Mathis der Maler', romantic opera about war; 'Cardillac'; 'Marienleben').
- Hin'denburg, Paul von (1847-1934), German general H-292-3
- chief commander W-162
- Ludendorff and L-212
- president of Germany G-74
- Russian front (1914) W-155
- Hindenburg, formerly Zabrze, Germany, manufacturing city and mining center of coal and iron district in Silesia, s.e. Prussia, about 95 mi. s.e. of Breslau; pop. 130,000; metal goods, glass, chemicals: *map* E-326d
- 'Hindenburg', a dirigible B-31
- Hindenburg line, a strong defensive zone of trenches and strong points constructed by the German army in 1916, from a point near Soissons n. over Vimy Ridge to Lille; sometimes taken to include the general defensive from Soissons east to Verdun: W-160
- before Arras A-310
- broken in Argonne battle A-282
- Hindi, dominant language of India I-34
- Hindu architecture, the building art developed under the influence of Brahmanism or Hinduism Angkor, *picture* A-331

ü=French u, German ü; gem, go; thin, then; ù=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

Benares, picture B-95
carved pillars I-39
Hall of the Winds, Jaipur, picture I-28
Pagoda at Tanjore, picture I-39
Hinduism H-293, I-34-5
animals venerated: cattle, pictures I-35; cobra C-290; hanuman monkey M-230, picture M-228
Banyan tree held sacred B-45
Brahma B-218
caste system H-293, I-36-7
Ganesa, elephant god, picture A-329
Ganges sacred G-5
Himalayas home of the gods H-292
Java J-205
number of adherents R-72
pilgrimages B-94-6, picture I-29
sacred books E-167
suttee I-37
Hindu Kush (*hīn'dy kush'*), a range of mountains in cent. Asia w. of Himalayas; highest point, Tirach Mir 25,400 ft.: A-325, map A-31
Afghanistan A-29
Hindu literature I-41-2
Hindus, Maurice Gershon (born 1891), writer, born Bolshoye Bikovo, Russia; came to U. S. in 1905; revisited Russia many times; began free-lance writing, 1917 ('Russian Peasant and Revolution'; 'Moscow Skies'; 'To Sing with the Angels').
Hindustan', Persian name for India, meaning "land of the Hindus"; used by natives for land n. of Vindhya Mts., or upper basin of the Ganges: I-31
Hindustani, a modern vernacular of the Indo-Aryan group of the Indo-European family of languages; spoken by about 100,000,000 people: P-171
Hines, John Leonard (born 1868), American army officer, born White Sulphur Springs, W. Va.; served in Spanish-American War, in Philippines, and in 1st World War (commander at Aisne-Marne defensive, battle of Saint-Mihiel, and Meuse-Argonne offensive); made major general 1921; chief of staff of U. S. Army 1924-26; appointed commander 9th Corps Area 1926; made commander of Philippine Department 1930; retired from active service, May 1932.
Hinkson, Katharine Tynan. *See in Index* Tynan, Katharine
Hinnom, Valley of, or Gehenna, in Palestine near Jerusalem J-211
Hinny, a hybrid animal, the offspring of a male horse and a female ass H-345
Hinterland, the "land behind" coast settlements which is dependent on them for trade; in 19th century Germany's claim to jurisdiction over such interior lands led to the rapid partition of Africa among the European powers.
Hiogo-Kobe (*hē-ō'gō kō'bā*), Japan. *See in Index* Kobe
Hipparchus (*hī-pār'kūs*) (died 514 B.C.), tyrant of Athens G-153
Hipparchus (2d century B.C.), Greek astronomer and mathematician, founder of trigonometry; discovered precession of the equinoxes and invented method of fixing terrestrial positions by circles of latitude and longitude, thereby founding scientific geography: T-139
Hippias (died 490 B.C.), Athenian tyrant G-158
Hippo, North Africa. *See in Index* Bône
Hippocampus, or sea-horse S-67, color plate F-72a-b

Hippocastanaceae (*hip-pō-kās-tā-nā-sē-ē*). *See in Index* Horse-chestnut family

Hippocrates (*hī-pōk'rā-tēs*) (460?-377? B.C.), famous Greek physician, called "father of medicine"; first to dissociate medicine from superstition and to insist on scientific study of disease: M-109

Hippocratic Oath, an oath presumably written by Hippocrates, whereby the young physician promises to live his life "in purity and holiness," to dedicate himself to "the advantage of the sick," and to keep professional secrets inviolate; taken in early times by graduates of medicine and used in modified form by some universities today.

Hippocrene (*hī-pō-k'rēn*), spring sacred to Muses P-101

Hippodrome (*hī-pō-drōm*), word from Greek, meaning course for horse or chariot racing; most famous ancient hippodromes were at Olympia and Constantinople; in modern times, term applied to large indoor amusement places as those in London and New York
circus during Justinian's time B-290
Constantinople, picture T-162

Hippolyta, queen of the Amazons; wore famous girdle given her by father, Ares
Hercules kills H-282

Hippolytus (*hī-pōl'i-tūs*), in Greek mythology son of Theseus. *See in Index* Phaedra

Hippopotamus, also called river horse, an amphibious mammal H-293-5, pictures H-294, M-294
ancestral relations F-163
hog related H-316
length of life, average, pictograph A-198

Hiram, king of Tyre about 1000 B.C.; contemporary of David and Solomon; raised Tyre to leading position in Phoenician Confederacy; subjugated Cyprus
Solomon aided by P-174

Hiram College, at Hiram, Ohio; founded 1850; liberal arts
Garfield at G-14

Hirohito (*hē-rō-hē'tō*) (born 1901), emperor of Japan since 1926; appointed regent in 1921; exponent of liberalism; broke age-long precedent concerning heirs to throne by leaving native shores for trip through Europe in 1921: J-191

Hiroshige (*hē-rō-shē'gā*) (1797-1858), Japanese artist J-202

Hiroshima (*hē-rō-shē'mā*), port at s. end of Honshu Island, Japan; opposite sacred island of Itaku-Shima; pop. 345,000; trade in lacquer ware, bronze: map J-186

Hirpini (*hē-rp'ni*), ancient Samnite tribe of s. Italy; revolted from Roman conquerors and joined Carthaginians in 2d Punic War; obtained Roman franchise after final defeat of Samnites by Sulla 83 B.C.

Hirsch, Emil G. (1852-1923), American-Jewish rabbi, born Luxembourg; minister Sinai Congregation, Chicago; professor rabbinical literature and philosophy, University of Chicago; leader advanced Judaism and philanthropy.

Hirsch, Maurice, Baron de (1831-96), Austrian financier and philanthropist; devoted millions to Jewish education, colonization, and charity in various countries.

Hirsch, Stefan (born 1899), American painter, born Nuremberg, Germany; first work cubistic and abstract; later work characterized by

simple, direct composition intensified by clear-cut lines and curves; favorite subjects town and city scenes.

Hirundinidae (*hīr-ūn-dīn'i-dē*), the swallow family of birds; includes purple martin, cliff swallow, barn swallow, tree swallow, bank swallow, violet-green swallow.

Hising, or von Hisinger (*hīs'in-jēr*), Wilhelm (1766-1852), Swedish chemist, co-discoverer with Berzelius of cerium.

Hispania (*hīs-pā'ni-ā*), Roman name for Spanish peninsula.

Hispanic Society of America, society to promote the study of Spanish and Portuguese languages, literature, and art, founded in New York City in 1904; membership honorary and restricted to 100 scholars of any nationality; maintains a reference library of about 100,000 volumes and an art museum which contains finest Hispanic collection in U.S.

Hispaniola (*hīs-pān-yō'lā*), island of West Indies; contains the republics of Haiti and Santo Domingo: H-197, 198, S-27, map N-150c
Las Casas' work for Indians L-67

Hispano-Moresque ware P-331

Hissarlik (*hī-sār'lik*), place in n.w. Turkey; site of ancient Troy: T-143
Schliemann's excavations S-40, T-143

Histadrut, Jewish labor federation of Palestine, founded 1920; comprises not only trade unions and co-operatives, but also social and cultural agencies; designed to create a labor commonwealth.

Histogram, a kind of graph G-136f, g

Histol'ogy, science which studies body tissues microscopically A-191, Z-227

'Historia Regum Britanniae' (*hīs-tō-ri-ā rē'jūm bri-tān'i-ē*) (History of the Kings of Britain), by Geoffrey of Monmouth A-316

Historic Age, defined A-252

Historic American Buildings Survey N-18

Historic Sites Act of 1935 N-18

History H-295-6, charts of world history H-297-310. *See also in Index* Archeology; Church, Christian; Civilization; Exploration; Middle Ages; Races of mankind; also names of countries, states, cities
ancient A-192, Outline A-192-3
archeology aids study A-252-3
armies and navies A-307f-308, N-56d-f

beginnings as a science H-296, G-173
begins with art of writing M-45
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Christianity, influence of C-231-4
civilization, development of C-243-8
communication influenced C-324a
current events, Outline H-310a-h
dates fixed by eclipses E-144
Father of History H-287
first exact date in E-203
Marx's economic interpretation M-73
medieval M-158-60, Outline M-160-2
migrations a factor in M-167-8
Muse of M-305
mythology's relation to M-327
presented in pageants P-11-12
social sciences include S-184

Hit, Iraq, ancient town on w. bank of Euphrates, about 90 mi. n.w. of Baghdad; pop. about 8000; asphalt deposits in vicinity.

Hit, in baseball B-56

Hitch, temporary rope fastening K-35

Hitchcock, Gilbert Monell (1859-1934), American newspaper publisher and Democratic political leader; founded Omaha *World Herald*; U.S. senator 1911-23; as chairman of senate foreign rela-

tions committee supported Versailles Treaty and League of Nations.

Hite, Jost (died 1760), American colonizer born Strasbourg, Alsace; emigrated because of religious persecution; founded settlements in New York, Pennsylvania, Virginia.

Hitler, Adolf (born 1889), chancellor and dictator of Germany H-311, G-75-76b, W-178, pictures D-67d, H-311, W-178c, i. See also in Index World War, Second

Greater Berlin plans B-99b

'Mein Kampf' H-311, W-178b

"Hit the Pot," game P-248, 250

Hittites (*hit'tits*), ancient people of Asia Minor H-311-12

invade Egypt E-210

iron used by I-135, E-210, H-312

languages deciphered A-252-3, H-311-12

Hittorf (*hit'ôrf*), **Johann Wilhelm** (1824-1914), German physicist; pioneer in electrochemistry and X-rays.

'Hitty', children's story by Rachel Lyman Field L-118, picture L-157

Hiva Oa (*hō'vū ō'ā*), a Pacific island; largest of the southern Marquesas.

Hivites (*hi'vits*), in Old Testament, one of the Canaanite peoples who inhabited Palestine before the arrival of the Israelites.

Hi-Y Clubs, clubs organized among high school boys and affiliated with the Young Men's Christian Association, with purpose "to create, maintain, and extend throughout the school and community, high standards of Christian character." Bible study and various other activities are carried on. The name Hi-Y Club was first used in 1914.

Hizen ware, or Imari ware, a fine Japanese porcelain J-200

Hjelm (*hyēlm*), **Peter Jacob** (1746-1813), Swedish chemist who isolated molybdenum.

Hjelmars (*yāl'mēr*) Lake, also **Hjalmars**, in Sweden, about 40 mi. w. of Stockholm; connected with Lake Mälars both naturally and artificially; area 185 sq. mi.: map N-173

Hoang Ho, **Hwang River**, **Hwang Ho**, or **Yellow River**, 2d largest river in China (2700 mi.). H-364, maps C-211, A-332a, b-c

dikes, repairing, picture C-221m

Hoar, **George Frisbie** (1826-1904), American statesman, born Concord, Mass.; "Free Soiler" and anti-imperialist; representative and senator from Mass. 1869-1901 ('Autobiography of Seventy Years').

Hoare, **Sir Samuel** (born 1880), British statesman; entered Parliament 1910; air secretary 1922-29; secretary for India 1931-35; foreign secretary under Baldwin 1935, forced to resign by criticism of Hoare-Laval plan for dismemberment of Ethiopia; first lord of admiralty 1936; home secretary 1937-40; ambassador to Spain after 1940.

Hoar frost F-210

Hoarhound. See in Index **Horehound**

Hoary alder, or speckled alder, tree-like shrub A-113

Hoatzin (*hō-āt'sin*), a South American bird showing curious resemblances to fossil archaeopteryx, pictures B-121

Hoban, **James** (1762?-1831), American architect, designer of White House W-86

Ho'bart, **Garret Augustus** (1844-99), American Republican leader, born Long Branch, N.J.

vice-president of U. S., table V-392

Hobart, cap. and largest city of Tasmania, on s. coast, 12 mi. above mouth of Derwent River; pop. 60,000; seat of University of Tasmania: T-14, 15, A-374, maps A-372a, b, picture T-15

Hobart College, at Geneva, N. Y.; men (separate institution for women, William Smith College); present title since 1860 (Geneva College 1822); arts and science.

Hobbema (*hōb'ū-mā*), **Meindert** (1638-1709), Dutch landscape painter P-21, picture P-20

Hobbes, **John Oliver**, pen name of **Pearl Mary Teresa Craigie** (1867-1906), English novelist and dramatist, born Boston, Mass.; vivid style, sparkling with epigrams and caustic humor ('A Study in Temptations'; 'Robert Orange'; 'The Vineyard'; 'Flute of Pan').

Hobbes, **Thomas** (1588-1679), English philosopher; famous for system of political and ethical philosophy; called "father of empirical psychology"; most noted work 'The Leviathan', treatise on philosophy of government: P-294

Hobble-bush. See in Index **Wayfaring tree**

Hobbs, **N. M.**, city in extreme s.e., 96 mi. from Roswell; pop. 10,619; oil and associated industries.

Hobby, **Oveta Culp** (born 1905), first director of The Women's Army Auxiliary Corps (organized May 1942), later Women's Army Corps, born Texas; formerly city attorney of Houston and an executive of the *Houston Post*.

Hobby, an activity outside his work in which a person is especially interested: for example, collecting or sports: H-313-313n

books H-313a-n, I-78

education for use of leisure L-93d

place in child development C-202

Hobhouse, **L. T.** (born 1864), English sociologist S-184

Hobkirk's Hill, battle of, British defeated Americans under Greene 1781, n. of Camden, S.C.; also called 2d battle of Camden.

Ho'boken, N.J., port of entry, railroad and industrial center opposite New York City on Hudson River; pop. 50,115; terminus of several important steamship lines and coal-shipping point; Stevens Institute of Technology: map N-90

water front, picture N-93

Hobson, **Richmond Pearson** (1870-1937), American naval hero, born Greensboro, Ala.; graduated U. S. Naval Academy; in Spanish-American War sunk collier *Merrimac* in attempt to close Santiago harbor; in charge of various naval constructions; member of Congress from Alabama 1907-15; active as lecturer and writer ('The Sinking of the *Merrimac*'): picture S-235

Hobson's choice, phrase meaning "this or nothing" originated from fact that Thomas Hobson (1544-1630), a stable-keeper of Cambridge, England, made each customer hire the horse nearest the door.

Hochelaga (*hō-shē-ū'gā*), Canada, early Indian village at mouth of Ottawa River.

Cartier at C-90

Hochkirch (*hōk'kīrk*), Germany, village 35 mi. n.e. of Dresden where Austrians defeated Prussians under Frederick the Great 1758 (Seven Years' War).

Hochstädt (*hōk'shtēt*) on the Danube, Germany, town in Bavaria, 60 mi. n.w. of Munich; battle of Blenheim 1704.

Hock'ey H-314

ice H-314, picture W-117

Hocking River, a stream in s.e. Ohio, flowing into the Ohio River; about 100 mi. long.

Hoc signo vince (In this sign conquer) C-346

Hodeida (*hō-dā'i-dā*), fortified seaport of Yemen, Arabia, on Red Sea; pop. 40,000; center of coffee trade: A-238, map A-242

Ho'der, in Norse mythology, blind god who slew Balder B-16

Hodgenville, Ky., town 45 mi. s. of Louisville; pop. 1348; about 3 mi. from here is the farm where Abraham Lincoln was born, preserved as a memorial: L-139, N-19

Hodges, **George** (1856-1919), American Episcopal clergyman and author, born Rome, N. Y.; at Calvary Church, Pittsburgh, 1881-94; dean Episcopal Theological School, Cambridge, Mass., 1894 until death ('The Human Nature of the Saints'; 'Everyman's Religion').

Hodgson, **Ralph** (born 1871), English poet, born Northumberland; poems outstanding for power and directness ('The Last Blackbird and Other Lines'; 'Eve and Other Poems').

Hodler (*hōd'lēr*), **Ferdinand** (1853-1918), Swiss painter and lithographer, leader among Swiss moderns; vigorous simplicity in landscapes, figures, portraits

Hódmezővásárhely (*hōd'mē-zū-vā-shār-hēl-yū*), agricultural town in s.e. Hungary, 15 mi. n.e. of Szeged; pop. 60,000.

Hoe, **Richard March** (1812-86), American manufacturer and inventor, born New York; with his brothers Peter S. and Robert made many contributions to development of printing press: P-348, picture I-115

Hoecake, form of corn bread P-221d

Hoek van Holland. See in Index **Hook of Holland**

Hoenir (*hū'nir*), in Norse mythology, god who with Odin and Loki created first man, Ask, and first woman, Embla, from trees in Midgard; from Odin they obtained life, from Hoenir, mind, and from Loki, the senses

Rodmar and N-140

Hof'burg, palace in Vienna V-297

Ho'fer, **Andreas** (1767-1810), Tyrolean patriot and popular hero, leader of insurrection against Bavaria; betrayed, court-martialed, and shot: T-176

Hofer, **Karl** (born 1878), German artist; some works are in Flemish tradition, others suggestive of Cezanne or Picasso, and still others abstract and expressionistic with highly stylized figures; favorite subjects circus life, nudes, portraits, still life, and interiors.

Hoff, **Jacobus Hendricus**, Van't. See in Index **Van't Hoff**

Höfding (*hōv'dīng*), **Harald** (1843-1931), Danish philosopher ('Problems of Philosophy'; 'History of Modern Philosophy'; 'Philosophy of Religion').

Hoffman, **Charles Fenno** (1806-84), American poet and novelist; wrote several novels of western life, but remembered only for his songs (especially 'Rosalie Clare' and 'Monterey') which were deservedly popular.

Hoffman (*hōf'män*), **Ernst Theodor Amadeus** (1776-1822), German novelist and composer; leader in romantic movement; best known

- for gruesome tales of the supernatural ('The Devil's Elixir').
- Hoffman, Josef Franz M.** (born 1870), Viennese modernist architect; structural austerity relieved by surface decorative patterns and rich color; noted chiefly for precisely proportioned industrial buildings.
- Hoffman, Malvina** (Mrs. Samuel B. Grimson) (born 1887), American sculptor born New York City; studied with Herbert Adams, Gutzon Borglum, and Rodin; work shows strength and individuality as well as wide range in subject, treatment, and material; author of 'Heads and Tales', an autobiography ('Russian Dancers'; portraits of Paderewski, Pavlova; groups and single figures illustrating racial types for Field Museum (Chicago Natural History Museum)).
- Hoffmann, August Heinrich** (1798-1874), called Hoffmann von Fallersleben, German poet and philologist; wrote verses to 'Deutschland über Alles'.
- 'Hoffmann, Tales of', opera by Jacques Offenbach
story O-233
- Hoffmann von Fallersleben.** See in *Index* Hoffmann, August Heinrich
- Hoffmann, August Wilhelm von** (1818-92), German chemist who helped to found German coal-tar industry; discovered benzol in coal tar (1845).
- Hofmann, Heinrich** (1824-1911), German historical and portrait painter; popular for ideal conceptions of life of Christ, also for paintings from mythology
- 'Christ in the Temple', picture J-213
- Hofmann, Josef** (born 1877), Polish pianist; an infant prodigy at six, made a successful concert tour of Europe at nine; in his mature years, considered both as an interpreter and as a technician, had few rivals; director of Curtis Institute of Music, Philadelphia 1926-38.
- Hofmannsthal** (*hōf'māns-tāl*), **Hugo von** (1874-1929), Austrian neoromantic dramatist and poet; dealt chiefly with imaginative world far away from real life ('The Death of Titian' one of his best plays; 'Elektra' and 'The Rose Cavalier' used as libretti for operas by Richard Strauss)
- 'The Rose Cavalier', story O-233
- Hofuf** (*hō-fōf*), city in Arabia, 40 mi. from Persian Gulf; pop. 30,000; map A-242
- Hog**, a domesticated mammal of the swine family H-314-16
- ancestral relations F-163, H-315-16
- breeding: effect of H-315-16, pictures A-52; famous breeds H-316, picture H-315
- cattle compared to, as meat producer H-315
- cholera, control H-316
- color inheritance H-284
- destroys rattlesnakes R-52
- draft animal in China H-315
- feed H-315: alfalfa A-116, picture A-117; corn C-366
- food production and marketing H-315: lard and bacon types H-316
- parasite, picture P-69: trichina W-180b, H-316
- producing regions H-316
- products H-315: bristles B-250; lard H-315, F-18-19; meat packing M-96-101
- Ho'gan**, house of Navajo Indians I-60, picture A-292
- Ho'garth, William** (1697-1764), English painter and engraver, called the "Molière of painting" H-317, P-21-2
- Hogben, Lancelot** (born 1895), English zoölogist and writer; Regius Professor of Natural History, University of Aberdeen; stresses practical and social significance of science and technology in 'Mathematics for the Millions' and 'Science for the Citizen'; came to U. S. 1940.
- Hog cholera**, an infectious bacterial disease afflicting swine; causes diphtheritic condition of intestine loss from, and control H-316
- Hogfish**, Spanish. See in *Index* Spanish hogfish
- Hogg, James** (1770-1835), the "Ettrick Shepherd," Scottish peasant poet ('Scottish Pastorals'; 'The Mountain Bard'; 'The Queen's Wake').
- Hogging down**, corn harvesting C-367
- Hog Island**, near Philadelphia, Pa.; municipal airport
- first World War shipyard W-170, picture W-168
- Hogmanay Day** H-323
- Hog-nosed snake** S-173
- Hog score**, in curling C-414
- Hogshead**, a unit of liquid measure, table W-67
- Hogue** (*ōg*), La, battle of. See in *Index* La Hogue
- Hogweed.** See in *Index* Ragweed
- Hohenfriedeberg** (*hō-ēn-frē'dū-bērk*), Germany, small town in Silesia, 36 mi. s.w. of Breslau; victory of Frederick the Great over Austrians and Saxons 1745 in War of Austrian Succession.
- Hohenheim**, Theophrastus Bombastus von. See in *Index* Paracelsus
- Hohenlinden** (*hō-ēn-līn'dēn*), Germany, village in Upper Bavaria, 19 mi. e. of Munich; French victory over Austrians in 1800.
- Hohenstaufen** (*hō-ēn-shtou-fēn*), a noble German family of the Middle Ages H-318, F-190, 192. For list of Hohenstaufen emperors see in *Index* Holy Roman Empire
- Ghibellines G-182
- Hohenzollern** (*hō-ēn-tsōl-ērn*), a noble German family H-318. For list of Hohenzollern kings see in *Index* Prussia
- growth of power P-358-9
- overthrow W-100
- Hohenzollern**, a province of Prussia: 441 sq. mi.; pop. 71,000: H-318
- Hohe Tauern** (*hō'h tou'ērn*), a division of the Eastern Alps. (Name also applied to a particular summit [8080 ft.] in this division): T-175
- Hokkaido** (*hōk-kā'dō*), or **Hokushu**, northernmost large island of Japan; 30,328 sq. mi.: map J-186
- Hokku**, a form of Japanese poetry J-191
- Hokusai** (*hō-ku-sā'ē*) **Katsushika** (1760-1849), Japanese artist, born Yedo, Japan; known for his illustrations and color prints: J-202, picture F-37, color plate J-202a-b
- Holbein** (*hōl'bīn*), **Hans**, the Elder (1460-1524), German painter, best known for 'The Basilica of St. Paul' and a 'Passion' in 11 scenes; later work shows Italian influence grafted on Flemish of his youth.
- Holbein**, **Hans**, the Younger (1497-1543), German painter, son of Hans, the Elder H-318-19
- drawing of German family, picture D-100
- portrait of Erasmus, picture R-75
- portrait of Nicholas Kratzer, picture H-318
- wood engraving E-294
- Holberg** (*hōl-bērg'*), **Ludvig**, Baron (1684-1754), Norwegian - Danish dramatist, historian, and philosopher, called the Molière of the North; made Danish a literary language; had vast influence over his countrymen ('Subterranean Journey of Niels Klim'; 'Comedies').
- Holboell's grebe** G-151
- Holborn** (*hōl'bōrn*), England, metropolitan borough in central part of London; pop. 39,000; contains Lincoln's Inn and Gray's Inn.
- Holbrook, Josiah** (1788-1854), educational reformer, born Derby, Conn.; founded American Lyceum, a movement for adult education; tried unsuccessfully to found "Lyceum City" at Berea, Ohio: C-163
- HOLC** (Home Owners' Loan Corporation) R-146g
- Holcomb, Thomas** (born 1879), U. S. marine officer, born New Castle, Del.; in 1st World War; commandant of Marine Corps Schools, Quantico, Va., 1935-36; commandant U.S. Marine Corps 1936-43.
- Holden, Edward Singleton** (1846-1914), American astronomer, born St. Louis, Mo.; president of University of California 1885-88; did most important work as director of Lick Observatory, Calif. 1888-98; librarian of U.S. Military Academy.
- Holding**, in boxing B-208
- Holding company**, a company which owns securities of one or more other companies and is in a position to control or influence the management of these companies
- Utilities Holding Company Act R-146j
- Holds**, in wrestling W-182-3
- Holidays and festivals** H-319-23
- All Fools' Day A-233
- American Forest Week A-248
- Arbor Day A-247-8
- Boxing Day, old English C-229-229a
- Canada H-320
- Chinese C-220-1, H-322, 323, picture C-221: Kites' Day C-220-1, K-27; New Year's C-220, N-112, 113, picture H-322
- Christmas C-226-30
- Easter E-140
- Epiphany C-229a, C-228
- Flag Day, first observed F-86
- foreign H-322-3
- French (July 14) F-202
- Greek D-91-2: Delphi D-44; Olympic games O-225
- Guy Fawkes' Day F-20
- Hallowe'en H-202
- India (Huli) A-233
- Japanese J-193-1, picture H-321; New Year's J-193, N-112
- Jewish H-323: New Year's N-113; Passover P-85; Purim E-306
- Latin American fiestas L-67k
- Mardi Gras, New Orleans, La. E-140, picture L-207
- May Day M-91
- Mecklenburg Declaration of Independence anniversary (North Carolina) N-159
- Memorial Day M-112
- New Year's Day N-112-13
- pageants P-11-12
- potlatch, Indian feast I-56, picture I-68
- religious H-323
- Roman: Bacchanalia D-70; Castor and Pollux, picture R-141; Minerva M-185; Pomona H-202; Saturnalia S-31
- Sabbath S-1
- St. Patrick's Day P-88, 89
- St. Valentine's Day S-11
- Swedish Midsummer's Day S-335, S-289
- Thanksgiving T-74, pictures T-75, H-319

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn. fōr, nōt, dō; cūre, būt, rȳde, fȳll, būrn;

Twelfth Night C-229a, C-228
United States H-319-20
Yule, or Jol, in northern Europe C-226-7

Holinshed (*hōl'inz-hēd*, or *hōl'in-shēd*), or Hollingshead, Raphael (died 1580), English chronicler, compiler of 'Chronicles of England, Scotland and Ireland', now valued because it was a source-book for the Elizabethan dramatists Shakespeare's debt to S-100

Holland, Clifford M. (1883-1924), American engineer, born Somerset, Mass.; authority on underwater tunnels; assistant engineer in building East River tunnels, 1906-07; chief engineer of vehicular tunnel under Hudson River between N. Y. and N. J., completed and named for him after his death.

Holland, John Philip (1844-1914), American submarine inventor, born Ireland S-314, P-88

Holland, Josiah Gilbert (1819-81), American editor and author, born Belchertown, Mass. ('Bittersweet'; 'Sevenoaks').

Holland, Mich., port and manufacturing city at head of Black Lake 25 mi. s.w. of Grand Rapids; pop. 14,616; grain market, leather, wood-ware, furniture, flour, beet sugar; Hope College, Western Theological Seminary: map M-153
tulip field, picture M-154a

Holland, North and South, chief provinces of the Netherlands H-323. See also Netherlands, Kingdom of

Holland cloth, a cotton or linen cloth, usually glazed or heavily sized; used for window shades.

Holland Tunnel N-133, picture N-131
automatic control of smoke A-385-6

Holler songs, chants sung by foremen of labor gangs F-135

Holles, Denzil Holles, Baron (1599-1680), English parliamentary leader active in opposing Stuart tyranny; imprisoned 1629 for anticrown demonstration in the Commons, he denied court's jurisdiction over acts committed in Parliament; helped Pym draw up Grand Remonstrance; participated in Civil War but opposed Cromwell and army policy.

Holley, Marietta (1850-1926), American author, born Jefferson County, N. Y.; wrote amusing stories concerning 'Samantha', and the sayings and doings of 'Josiah Allen's Wife'.

Hollingshead, Raphael. See in Index Holinshed

Hollins College, at Hollins College, Va.; founded 1842; for women; liberal arts.

Holly, an evergreen tree or shrub H-323
Christmas customs, origin C-227
leaves, picture P-240
used for yerba maté T-27, picture S-206

Holly family, or Aquifoliaceae (*āk-wī-fō-lī-ā'sē-ē*), a family of trees and shrubs, native chiefly to Western Hemisphere, including holly, yaupon, black alder, winterberry, and Ilex paraguariensis, the source of yerba de maté.

Hollyhock, a garden plant (*Althaea rosea*) of the mallow family H-323-4
how to plant G-10

Hollywood, Calif., part of Los Angeles; formerly separate town, annexed 1910; center for motion picture industry; annual production of Pilgrimage Play.

Hollywood Bowl, Los Angeles, Calif., 60-acre natural amphitheater; musical and dramatic functions held here include symphonies, operas, and the Easter sunrise service: picture C-31

Hollywood Cemetery, Richmond, Va. R-107

Holm, Hanya, modern dancer, choreographer, and teacher, born Worms, Germany; studied with Mary Wigman; came to U.S. 1931; important work at Bennington College, Vermont, and at other colleges; outstanding choreographies are 'Trend', 'Metropolitan Daily', 'Tragic Exodus'.

Holme, Constance (Mrs. Frederick Burt Punchard), English novelist, born in village of Milnthorpe, Westmorland, which is the setting of her distinctive novels: 'The Old Road from Spain', 'The Trumpet in the Dust', 'Beautiful End'; *Femina-Vie Heureuse* joint award (1921) for 'The Splendid Fairing' as best piece of imaginative English by author whose work had formerly been neglected.

Holmenkollen, mountain and bay near Oslo, Norway
winter sports N-172

Holmens Kanal, Denmark, picture D-51

Holmes, Elias Burton (born 1870), American traveler and lecturer, born Chicago; traveled in almost all countries; lectures called 'The Burton Holmes Travelogues'.

Holmes, John Haynes (born 1879), American clergyman and author, born Philadelphia; originally Unitarian, became independent, 1919; pastor Church of the Messiah, New York, later called The Community Church 1907-41 ('The Grail of Life'; 'Palestine Today and Tomorrow'; 'Rethinking Religion').

Holmes, Mary Jane (1839?-1907), American writer of highly sentimental novels of domestic life ('Tempest and Sunshine').

Holmes, Oliver Wendell (1809-94), American poet and essayist H-324, picture A-178
anesthetics named by A-196

invents open stereoscope S-286
quoted: on Emerson E-260; 'Old Ironsides' N-56; 'The Autocrat of the Breakfast Table' W-188

Holmes, Oliver Wendell (1841-1935), American jurist H-324

Holmes, Sherlock. See in Index Sherlock Holmes

Holmes, William Henry (1846-1933), American anthropologist and artist, born Harrison Co., Ohio; pioneer investigator of archaeology of the Southwest; made important contributions on Indian art; developed fine museum exhibits; chief, Bureau of American Ethnology; curator, anthropology, U. S. National Museum and National Gallery of Art ('Handbook of Aboriginal American Antiquities'; 'Pottery of the Ancient Pueblos').

Holmium, a chemical element, table C-168

Holocene (*hōl'ō-sēn*), in geology, the epoch of recent time, including the present, picture G-41

Holocentrus, scarlet, a fish, picture F-67

Holofernes (*hōl-ō-fēr'nēz*), Assyrian general slain by Judith; story told in book of Judith.

Hol'ograph will, in law W-98

Holokus, Hawaiian garments H-240

Holothuroidea (*hōl-ō-thū-roid'ē-ā*), a

class of echinoderm animals including sea-cucumbers.

Holst, Axel (1860-1931), Norwegian chemist and physician; associate of Dr. Theodor Frölich

experiments with scurvy V-311b
Holst, Gustav Theodore (1874-1934), English composer of Swedish descent; born Cheltenham, Gloucestershire; musical settings for poems ('Hymns from the Rig Veda'; 'Ode to Death'); choral works ('Hymn of Jesus'); great orchestral suite ('The Planets'); operas ('The Perfect Fool').

Holstein (*hōl'stīn*), former duchy of Denmark; since 1866 part of Schleswig-Holstein. See in Index Schleswig-Holstein

Holstein-Friesian, or Holstein, dairy cattle C-104, pictures D-4, M-201

Holston River, branch of Tennessee River; rises in s.w. Va. and flows 200 mi. s.w. into e. Tenn.: map T-46

Holt, Hamilton (born 1872), American editor and educator, born Brooklyn, N. Y.; editor and owner, *The Independent*, 1913-21; president Rollins College (Winter Park, Fla.) after 1925 ('Undistinguished Americans').

Holt, L. (Luther) Emmet (1855-1924), American physician, born Webster, N. Y.; outstanding authority on care of children and children's diseases ('The Care and Feeding of Children'; 'Diseases of Infancy and Childhood').

Holy Alliance, league formed 1815 by sovereigns of Russia, Austria, and Prussia E-324

Alexander I, part of A-113
Monroe Doctrine and M-241

'Holy Anthony, The', engraving by Dürer, picture E-293

Holy City (Jerusalem) J-211-12

Holy Cross, College of the, at Worcester, Mass.; for men; Roman Catholic (Jesuit); founded 1843; liberal arts.

Holy Cross, Mount of the, peak of the Sawatch Range in Colorado (13,986 ft.): C-312, map C-310, picture C-314

Holy Cross National Monument, Colo. N-22a

Holy Eucharist (*yū'kă-rīst*), or Lord's Supper, in Christian church, a sacrament in which bread and wine are taken in commemoration of Christ's Last Supper.

'Holy Family', by Michelangelo, picture M-147

Holy Grail, or Sangreal, cup used by Christ at Last Supper G-1
Arthurian legends G-1, R-160, A-316, pictures A-315, 316

Holyhead, Welsh port on Holy Island, just w. of Anglesey; pop. 11,000: map E-270a

Holy Lance, the lance which pierced the Savior at the Crucifixion (John xix, 34)
legend about C-403

Holy Land, Palestine P-33-7. See also in Index Palestine

Holy League (1511), formed by Pope Julius II, Ferdinand II of Spain, and Venice, to drive France from Italy; later joined by Emperor Maximilian and Henry VIII Germany T-80

Holy League (Catholic League), formed 1576 to suppress Huguenots Germany T-80

opposes Henry of Navarre H-279

Holy Names, College of the, at Oakland, Calif.; Roman Catholic institution for women, founded 1880; arts and sciences.

RULERS OF THE HOLY ROMAN EMPIRE

REIGN		REIGN	
800-814	Charlemagne	1298-1308	Albert I of Hapsburg
814-840	Louis the Pious	1308-1313	Henry VII of Luxemburg
840-911	Later Carolingians	1314-1347	Louis IV of Bavaria
[911-918]	Conrad I	1314-1330	Frederick the Fair of Austria
SAXON LINE			
919-936	Henry I, the Fowler	1347-1378	Charles IV
936-973	Otto I, the Great		Wenceslaus
973-983	Otto II	1378-1400	Rupert of the Palatinate
983-1002	Otto III	[1400-1410]	Sigismund
1002-1024	Henry II	1410-1437	
FRANCONIAN LINE			
1024-1039	Conrad II	1438-1439	Albert II
1039-1056	Henry III	1440-1493	Frederick III
1056-1106	Henry IV	1493-1519	Maximilian I
1106-1125	Henry V	1519-1556	Charles V
[1125-1137]	Lothair II of Saxony	1556-1564	Ferdinand I
HOHENSTAUFEN LINE			
1138-1152	Conrad III	1564-1576	Maximilian II
1152-1190	Frederick I (Barbarossa)	1576-1612	Rudolph II
1190-1197	Henry VI	1612-1619	Matthias
1198-1208	Philip of Swabia	1619-1637	Ferdinand II
1198-1214	Otto IV	1637-1657	Ferdinand III
1215-1250	Frederick II	1658-1705	Leopold I
1250-1254	Conrad IV	1705-1711	Joseph I
[1254-1273]	Great Interregnum	1711-1740	Charles VI
RULERS FROM VARIOUS HOUSES			
1273-1291	Rudolph of Hapsburg	[1742-1745]	Charles VII of Bavaria
1292-1298	Adolf of Nassau	1745-1765	Francis I
		1765-1790	Joseph II
		1790-1792	Leopold II
		1792-1806	Francis II (after 1806 reigned as Francis I of Austria)

Holyoake (*hōl'yōk*), George J. (1817-1906), English writer and reformer; championed cooperative movement and secularism; last person to be imprisoned in England for blasphemy.

Holy Office, Congregation of the, judicial body of Roman Catholic church, headed by the pope and a cardinal; censors and condemns dangerous books, passes judgment on heresy, mixed marriages, and questions of dispensation: I-80

Hol'yoke, Mass., city 8 mi. n. of Springfield on Connecticut River, noted for its paper mills; pop. 53,750; silks, textiles, thread, machinery: *map* M-82

Holyoke, Mount, a steep hill 6 mi. n. of Holyoke, Mass.; famous for view of Connecticut valley from its summit; 954 ft. high: *map* M-82

Holy orders, a sacrament C-232

Holy Roman Empire H-324-5, G-71-2. *See also in Index* Austria; Germany, history of; also emperors by name. For list of rulers of the Holy Roman Empire see *table* on this page

Charlemagne founds H-324, C-144-6 coronation chair A-1 coronation glove, *picture* G-27 effect of Thirty Years' War E-323 Golden Bull G-72 Guelfs and Ghibellines G-182 Hapsburgs H-212, 214; Charles V C-146-7

Hohenstaufens H-318: Frederick Barbarossa F-190 Innocent III I-80, O-256 investiture conflict G-177: Henry IV and Henry V H-274-5 Otto I revives O-256

Holyrood Palace, Edinburgh, Scotland E-156

Holy Saturday E-140

Holy Sec. *See in Index* See

Holy Sepulcher (*sēp'ul-kēr*), in Jerusalem J-211-12 Crusades C-403-6

Holy Sepulcher, Church of the, Jerusalem J-211-12

Holy Thursday, or Maundy Thursday E-140

Holy water, water blessed by priest and used by Roman Catholics, Greek Orthodox, and some Anglicans in making the sign of the cross; used also in ceremonies and sacraments.

Holy Week E-140

Holz (*hōlts*), Arno (1863-1929), German poet and critic regarded as founder of German impressionist school, freeing language from conventionality; rejected rhyme and strophe in verse ('Phantasus').

Homage, a feudal ceremony F-28

Home and school kindergarten link between K-19 Parent-Teacher Associations P-70

Home economics H-325-9, *Outline* H-327-9. *See also in Index* chief subjects below

air conditioning H-266, R-68

baby care B-1-4

bibliography H-329: hobbies

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camping problems C-42-47b

canning industry C-73-5

child care H-326-7

child development C-197-204b

clothing H-326, C-273-9: principal

fabrics T-69-71

color harmony in clothing, furnishings, decorations C-308d-e

cooking C-349-52: bread and baking

B-228-32

dress D-110-13

electrical devices, *pictures* E-236

entertaining guests E-312-312a: being a guest E-312a-b; private and

school parties E-312b

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C-347a-d; letter writing L-98a-d

family and tribal life F-8-12: marriage M-68-9

first aid F-62-6

food F-140-6, H-372-4: pure food

laws P-368d-69

furniture F-219-22

heating and ventilation H-263-6

hygiene H-374-5

interior decoration I-98-107, H-325:

color harmony C-308d-e

kitchen equipment C-352, B-267, *pictures* C-351, B-267, E-236

lamps and lighting L-56-9: indirect

lighting E-235 laundry and dry-cleaning L-71, C-276

leisure increased by machinery L-93b library for children at home L-107-10: list of books for L-110-21 management, home H-326, *Outline* H-329

nursing, home H-327

play materials for various ages P-258

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sewing S-87-92

shelter S-110-14: house planning

E-266-8

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Home Economics, Human Nutrition and, Bureau of, U. S. H-325, U-228

Home life. *See also in Index* Family and tribal life

American colonies: A-163

child's own library L-107-110: list of books L-110-21

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family relationships H-327: factor in child training C-204, 204b; influence of children E-1

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manners at home E-311

modern city U-251-251a

pioneer life P-221d-e

recreational center L-93c

sociology S-183

Home Loan Bank Board, Federal (FHLBB) U-232, R-146f

Homemade camp equipment C-45

Home management H-326, *Outline* H-329

Home nursing H-327

Homeopathy, a system of medicine founded by Hahnemann; treats disease by administering drugs which excite in normal persons symptoms similar to those of disease treated ("likes are cured by likes").

Home Owners' Loan Corporation (HOLC) R-146g

Ho'mer, ancient Greek poet, to whom is ascribed authorship of 'Iliad' and 'Odyssey' H-329-30, G-171

life of early Greeks pictured G-156

translations H-330: for children

L-161; Pope's P-303

words used E-282

Homer, Louise (born 1872), American dramatic contralto singer, born Pittsburgh, Pa.; married Sidney Homer, composer; distinguished by a voice remarkably even in quality over a great compass; notable rôles, Amneris in 'Aida'; Laura in 'La Gioconda'; Ortrud in 'Lohengrin'.

Homer, Winslow (1836-1910), artist, born Boston; pictures the ocean and fisher folk with uncompromising verity ('The Maine Coast', Metropolitan Museum, and 'On a Lee Shore'); P-27

'Gulf Stream', *picture* P-28

'Homer, A Reading from', by Alma Tadema, *picture* T-142

Homer, a pigeon. *See in Index* Homing pigeon

Home rule

India I-40, G-5

Ireland I-128-9: Belfast opposes

B-85; Gladstone's measures G-98;

O'Connell's work O-201; Parnell

supports P-81-2

Homespun, coarse, loosely-woven

woolen fabric, formerly made in

homes on hand looms from hand-spun yarn, now imitated in factories.

Homestake Mine, large gold mine in w. South Dakota S-219, 218

Homestead, Pa., important steel-manufacturing borough 5 mi. s.e. of Pittsburgh; pop. 19,041; scene of notable strike in 1892: *map* P-112

Homestead National Monument of America, in Nebraska N-22a

Homesteads
Alaska A-104
Alberta A-110
laws, U. S. L-60, P-221k; first bill J-222, L-60; immigration encouraged by I-22-3

'Home, Sweet Home', popular song from opera 'Clari, or the Maid of Milan', by John Howard Payne, first produced 1823; music adapted from old Sicilian air by Sir Henry Bishop.

Homework, industrial S-334
Japan J-188
putting-out system I-74a-b, E-275

Homily, name applied to a didactic religious or ethical discourse.

Homing pigeon, or homer P-216, A-202, *picture* P-217

Hom'iny C-368
Indian dish I-57
pioneers use P-221d

Ho'mo, generic name for man M-46

Homogenized (hō'mō-jēn-izd) milk D-4

Homogenizer, machine for breaking up fat globules in milk M-173

Homo heidelbergensis, the Heidelberg man M-46

Homo neanderthalensis, the Neanderthal man M-46

Homonym, name given to words different in meaning but similar in sound or spelling or both, as pair, pare, pear.

Homophones, words sounded alike but spelled differently S-245

Homoptera, order of insects. *See in Index* Hemiptera

Homo sapiens, human species to which modern man belongs M-46

Honan (hō-nān'), inland province of e. cent. China; 66,693 sq. mi.; pop. 34,290,000; along Hwang (Yellow) River; land level and fertile and heavily populated; cap. Kail-feng; cereals, cotton, tobacco, indigo, hemp, copal, iron; center of early Chinese culture: *map* C-212

Hondo (hōn-dō). *See* Honshu

Honduras (hōn-dg'rās), republic of Central America; 46,250 sq. mi.; pop. about 1,000,000; cap. Tegucigalpa: H-330, C-131-4, *maps* C-132, N-150c. *See also in Index* Central America

flag F-95, *color plate* F-88
jungle, *picture* C-133
literature L-67v-w
mahogany M-37, *picture* C-133b
Mayan civilization Y-211, A-147-8

Honduras, British. *See in Index* British Honduras

Honduras, Gulf of, inlet of Caribbean Sea on e. coast of Central America, *map* C-132

Honegger, Arthur (born 1892), French composer, born Havre, of Swiss parents; was leader of young French composers known as "The Six"; won first success with 'Pacific 231', musical impressions of locomotive, for orchestra ('Judith', opera; 'King David', oratorio).

Honesty
Diogenes' search for honest man D-69, *picture* D-70
Little Talk by Arthur Mee H-331

Honesty. *See in Index* Lunaria

Honey B-76, 74, *pictures* B-76b
alfalfa A-117
ancient use B-76, S-319
buckwheat B-258
clover C-281, 282
color and flavor B-76, B-258
extracting from comb, *picture* B-76b
glucose content G-107
manufactured by bees B-74, *picture* B-75
poisonous from laurel L-72
producing regions B-76

Honey badger. *See in Index* Ratel

Honey bear. *See in Index* Kinkajou

Honey-bee B-73-6, *color plate* W-32a-b. *See also in Index* Bee

Honeycomb, waxy many-celled structure made by bees for holding honey B-73, 74, *pictures* B-76b

Honeydew, secreted by aphids A-226

Honeydew melon M-112

Honeylocust, a thorny tree of the legume family L-179
name applied to mesquite M-121
used in hedges H-269

Honeymoon, origin M-69

Honeysuckle, various shrubs bearing fragrant trumpet-shaped flowers H-332
wild honeysuckle or azalea A-408

Honeysuckle family, or Caprifoliaceae (kăp-rī-fō-lī-ā'sē-ē), a family of plants and shrubs, native to north temperate regions and mountains of the tropics, including cranberry-bush, snowball bush, the elders, twin-flower, honeysuckles, and weigelas.

Hong Kong, China, British colony, including island city; pop. about 1,000,000: H-332-3, *map* C-212
harbor, *picture* H-214
Victoria H-332, *picture* C-221o

"Honi soit qui mal y pense" D-35

Hon'iton pillow lace L-48

Honolulu (hōn-ō-lō'lo), cap. of Hawaiian Islands, on s.e. shore of island of Oahu; pop. 179,358: H-240-1, *maps* H-242, 243, *picture* H-241

Honor, decorations of D-31-3. *See also in Index* Decorations of honor

Honor, Legion of, French order of merit, reward for civil and military services D-32

Honor, titles of. *See* Titles of nobility

Honorable, title D-35

Honorary distinctions, of universities and learned societies D-35

Honorius, Flavius (384-423), Roman emperor of the West; son of Theodosius A-99
ends gladiatorial contests G-96

'Honor of the Playing Field', a Little Talk by Arthur Mee A-357

Honors courses, in colleges U-259

Honshu (hōn-shō'), formerly Hondo, largest island of Japanese Empire; 86,953 sq. mi.: J-185, 188b, *map* J-186, *picture* J-186c
climate J-186c

Hooch, or Hoogh (hōk), Pieter de (1629-78?), Dutch artist, born Rotterdam; best known as a genre painter; his interiors illuminated with splashes of daylight or sunlight of varied intensities rank high in Dutch art.

Hood, John Bell (1831-79), Confederate Civil War general, born Owensville, Ky.; commanded divisions at Gettysburg and Chickamauga; commander of Army of the Tennessee, succeeding Johnston defeat at Nashville T-82; national cemetery marks site N-12a

Hood, Raymond Mathewson (1881-1934), architect, born Pawtucket,

R.I.; with John Mead Howells designed Tribune Tower, Chicago, 1922; his New York City firm aided in Rockefeller Center development.

Hood, Robin, famous English outlaw R-118-20, *pictures* R-119, L-116

Hood, Samuel, Viscount (1724-1816), English naval commander-in-chief in America 1767-71; distinguished in battles 1780-83 with French fleet under De Grasse; in Mediterranean 1793; great tactician.

Hood, Thomas (1798-1845), English poet and humorist whose fame rests on his serious poems 'The Song of the Shirt', 'The Bridge of Sighs', and 'Miss Kilmansegg'.

Hood, Mount, in Cascade Range of n. Oregon 11,253 ft.; 45 mi. s.e. of Portland: P-307, *picture* O-247
volcanic nature L-73

'Hood', battle cruiser N-55

Hood College, at Frederick, Md.; founded 1893 by Reformed church; for women; arts and sciences.

Hooded basilisk, or helmeted basilisk, a lizard L-170-1, I-11

Hooded seal S-70

Hoo'doo, a person or thing whose presence causes bad luck derived from voodoo M-30

Hoof, horny sheath encasing toes of many animals; corresponds to finger nail or toe nail of man. *See also in Index* Ungulates
horse H-341, F-146, E-341, H-207, *pictures* H-340, F-147
stockyards by-product M-97

Hoof and mouth disease, same as foot and mouth disease C-106, Z-222

Hooff (hōft), Pieter Corneliszoon (1581-1641), Dutch poet and historian; studied law and history at Leyden; translated Tacitus into Dutch and followed his style as historian; founded circle of intellectuals including poet Huygens (prose works: 'Henry IV of France', 'Dutch History'; poetry: 'Minneliedereren', 'Baeto').

Hoogh (hōg), Pieter de. *See in Index* Hooch, Pieter de

Hooghly (hōg'li), or Hugli, the westernmost channel in Ganges delta G-5

Hook, in boxing B-208

Hoo'ka, oriental pipe, *picture* P-131

Hooke, Robert (1635-1703), English physicist, born Isle of Wight; made curator of experiments to the Royal Society 1662, and secretary 1677-82; first scientist to recognize principle of planetary motion; work furnished basis for Newton's theories
law of elastic displacement W-65-6
watch spring, first to use W-37

Hooked rugs, colonial A-172, *picture* I-103

Hooker, Joseph (1814-79), "Fighting Joe," American Civil War general, born Hadley, Mass.; commanded Army of Potomac (1863) succeeding Burnside; resigned command after losing battle of Chancellorsville; later commanded victorious Army of Cumberland at "Battle above the Clouds": C-157

Hooker, Sir Joseph Dalton (1817-1911), eminent English surgeon and naturalist; made important additions to botanical knowledge; expeditions to Antarctic regions, Australia, the Himalayas, and Syria; wrote 'Genera Plantarum'; friend of Darwin.

Hooker, Richard (1553-1600), English author, wrote 'Laws of Ecclesiastical Polity', a masterly ex-

- position of philosophical and political principles; it has been called the earliest English prose work "with enough of the preserving salt of excellence to adapt it to the mental palate of modern readers."
- Hooker, Thomas (1586-1647), Puritan clergyman, born England; helped form (1643) New England Confederation: A-154
founds Connecticut colony C-339
- Hooker, Mount, Canada, peak near boundary of British Columbia and Alberta; elevation 10,782 ft.
- Hook of Holland (Dutch, *Hoek van Holland*), point of land at mouth of Maas (Meuse) River, 18 mi. from Rotterdam, map B-87
- Hooks and eyes, sewing of S-92
- Hookworm, intestinal parasite H-333
- Hoonah, Alaska, village on Chichagof Island, in s.e. Alaska, 50 mi. s.w. of Juneau; pop. 716; U.S. government school for natives; fish canneries; sawmill: map A-105
- Hoop-back chair, back formed with curved piece of wood held by vertical spindles A-171
- Hooper, John (1495?-1555), English martyr, bishop, and religious reformer; burned as heretic in reign of Mary I.
- Hooper, William (1742-90), signer of Declaration of Independence; born Boston, Mass.; North Carolina's delegate to Continental Congress: N-159
- Hoo'poe, any bird of the genus *Upupa*, native to warmer regions of Old World; common European hoopoe about size of bluejay; plumage black, white, and buff; long pointed bill; large erectile crest.
- Hoop skirt D-109
- Eugénie crinoline D-112-13
- Hoop snake, a mythical reptile said to overtake victims by holding its tail in its mouth and rolling like a hoop; its tail said to have poisonous sting. Story common in s.e. U. S.
- Hoorn, or Horn, Philip de Montmorency, Count (1518-68), Flemish patriot B-254
- Hoo'sac Mountain, a spur of the Green Mts. in n.w. Massachusetts (Spruce Hill, 2588 ft.), map M-82
- Hoosac River, rises in w. Mass., flows n.w. through Vermont about 90 mi. to Hudson River.
- Hoosac Tunnel, in n.w. Mass., through Hoosac Mt. to North Adams T-154
- "Hoosier poet" R-108
- 'Hoosier Schoolmaster', novel of Middle West pioneers by Edward Eggleston.
- Hoosier State, popular name for Indiana I-50
- Hooton, Earnest Albert (born 1887), anthropologist, born Clemansville, Wis.; began teaching anthropology at Harvard, 1913; made curator of Peabody Museum, 1914 ('Up From the Ape'; 'Why Men Behave Like Apes and Vice Versa').
- Hoover, Herbert Clark (born 1874), 30th president of United States H-333-8, picture H-333
administration (1929-33) H-334, 335-8, U-251
agricultural policy H-335-6
arbitration, Tacna-Arica A-246
aviation progress A-71, H-335, pictures A-72, 73
Bank for International Settlements I-110
economic conditions: depression H-336-8; progress H-335
efficiency in government, activities H-335
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- foreign policy H-335
Hawley-Smoot tariff H-334, 337
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Reconstruction Finance Corporation H-337
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- ancestry and early life H-333-4
Belgian relief work H-334
characteristics, business and political H-337
defeat in 1932 election H-338
election to presidency H-335
food administrator H-334
mining engineer H-333-4
quoted B-213, L-93
secretary of commerce H-335
- Hoover, J. Edgar (born 1895), American lawyer and criminologist, born Washington, D.C.; special assistant to attorney general 1919-21; assistant director, Bureau of Investigation 1921-24, director after 1924; raised standards of bureau and founded laboratories for crime detection.
- Hoover, Lou Henry (1875-1944), wife of President Hoover W-94, 87, H-334
- Hoover Dam, former name of Boulder Dam.
- "Hooverize," 1st World War term H-334
- Hop, a plant. See in Index Hops
- Hop, Japanese, an ornamental twining herb (*Humulus japonicus*) of the mulberry family usually with pretty 5-lobed leaves splashed and streaked with white; hardy annual.
- Hopateong, (*hō-pāt'kōng*), Lake, in New Jersey, 24 mi. w. of Paterson; about 8 miles long; picturesque scenery; popular summer resort.
- Hop clover, or shamrock S-101
- Hope, Anthony, pen name of Sir Anthony Hope Hawkins (1863-1933), English novelist; 'The Prisoner of Zenda' and 'Rupert of Hentzau' set fashion for romantic comedies involving noblemen of fictitious principalities; later works are more serious and deal with modern social and ethical problems.
- Hope College, at Holland, Mich.; Dutch Reformed Church; founded 1866; classics, philosophy, natural science, modern languages, English, mathematics.
- Hopeh (*hū'bd'v*), or Hopei, formerly Chihli, province of n.e. China; about 55,000 sq. mi.; pop. 29,000,000; important cities Peiping and Tientsin; millet, wheat, sorghum, maize, coal, iron ore: map C-212
Japanese control C-221a
- Hopewell, Va., industrial city at confluence of Appomattox and James rivers 20 mi. s.e. of Richmond; pop. 8679; nitrates, rayon, paper, wood pulp and pulp board; purified cotton linters: V-306
- Hopewell Village, national historic site near Reading, Pa. N-18
- Hophornbeam, a genus (*Ostrya*) of slender trees with very hard wood, brownish furrowed bark; often planted as ornamental tree.
- Hopi (*hō'pi*), or Moki, tribe of Shoshonean Pueblo Indians in n.e. Arizona P-365, A-290
customs A-293
doll, picture A-293
snake dance I-64
village of Walpi, picture I-55
- Hopkins, Arthur (born 1878), American play producer, born Cleveland, Ohio, produced 'Anna Christie', 'What Price Glory', 'The Petrified Forest,' and many other plays.
- Hopkins, B. Smith (born 1873), American chemist, born Owosso, Mich.; professor of chemistry, University of Illinois after 1923; with colleagues discovered illinium: C-167, picture C-175
- Hopkins, Ernest Martin (born 1877), American educator, born Dunbarton, N.H.; organized industrial concerns 1910-16; president Dartmouth College after 1916.
- Hopkins, Esek (1718-1802), first commander of American Navy, born Scituate, R. I.; captured British fort and naval station on island of New Providence, Bahamas, 1776; dismissed for later failures N-56d
- Hopkins, Sir Frederick Gowland (born 1861), English biochemist; professor at University of Cambridge after 1914; Nobel prize 1929 work on vitamins V-311b
- Hopkins, Gerard Manly (1844-89), English poet; converted to Catholic faith; ordained to priesthood 1877; poems marked by originality of words and rhythm ('Wreck of the Deutschland'; 'Pied Beauty').
- Hopkins, Harry L. (born 1890), American public official, born Sioux City, Ia.; appointed federal emergency relief administrator 1933; works progress administrator 1935-38; U. S. secretary of commerce 1938-40; special adviser to Franklin D. Roosevelt after 1940, administrator of lend-lease program.
- Hopkins, Johns (1795-1873), American financier and philanthropist, born on farm in Maryland; became great merchant and leading financier in Baltimore; founded Johns Hopkins University and Johns Hopkins Hospital in Baltimore.
- Hopkins, Mark (1802-87), American educator and author, born Stockbridge, Mass.; president, Williams College 1836-72; stressed the development of the individual student Garfield praises G-14
- Hopkins, Oceanus, son of Steven Hopkins, a Mayflower pilgrim, born at sea M-94
- Hopkins, Stephen (1707-85), signer of Declaration of Independence; born Providence, R. I.; governor of Rhode Island (1755-68).
- Hopkinson, Francis (1737-91), American jurist, one of signers of Declaration of Independence; admiralty judge of Pennsylvania 1779-89, then U.S. district judge
song writer M-316
- Hopkinson, Joseph (1770-1842), American jurist, son of Francis Hopkinson
author of 'Hail Columbia' N-24
- Hopkinsville, Ky., city 60 mi. n.w. of Nashville, Tenn.; pop. 11,724; tobacco market, flour mills; agricultural, coal, and timber interests; Bethel Woman's College: map K-11
- Hoplite (*hōp'lit*), heavy-armed Greek warrior, picture A-305
- Hop-o'-My-Thumb, a fairy, hero of several nursery stories.
- Hopper, Edward (born 1882), painter and etcher, born Nyack, N.Y.; important in "American scene" painting (small town scenes, railway tracks and trains, old houses); naturalistic, highly simplified work.
- Hopper, (William) De Wolf (1858-1935), American actor, starred in Gilbert and Sullivan's operas, especially 'The Mikado', 'Patience', 'Pinafore'.

Hoppner, John (1758-1810), English portrait painter, rival of Sir Thomas Lawrence ('Nelson').

Hops, climbing herbs whose fruits are used in brewing beer H-338 picking, picture W-31

Hop-Scotch, old English children's game; player hops from one division to another of a diagram marked, or scotched, upon the ground, kicking a stone, or tile, with the foot on which he hops.

Ho'quiam, Wash., port on Grays Harbor, 80 mi. s.w. of Tacoma; pop. 10,835; lumbering and fishing industries and shipping interests: map W-29

Hor'ace (Quintus Horatius Flaccus) (65-8 B.C.), Latin lyric poet L-69, picture R-129

son of a freedman S-160

Horae (hō'rē). See in Index Hours

Horatii (hō-rā'shī-i), three legendary Roman heroes R-129

Horatio (hō-rā'shī-ō), in Shakespeare's 'Hamlet', devoted friend of Hamlet.

Horatius Cocles (hō'klēz), legendary Roman hero T-88-9

Hore'hound, or hoarhound, bitter-aromatic perennial herbs comprising the genus *Marrubium* of the mint family; the common or white horehound (*Marrubium vulgare*), found in most regions of Europe and in the U.S., is a bushy perennial 1 to 1½ ft. high with roundish wrinkled leaves covered with white down and whorls of small white flowers; it is used as an infusion with sugar for coughs or as a candy.

Horizon (hō-rī'zōn), circular line formed by apparent meeting of earth or sea and sky; in astronomy, circle formed by plane passing through center of the earth perpendicular to line of gravity, produced to meet the heavens.

Horizon, artificial aviation device A-76, 78, picture A-77

navigation device N-46

Horizontal trusts T-146-7

Horizontal unions, in labor L-44a

Hormones (hō'r'mōns), secretions of ductless glands G-99-100, B-110 regulate digestion P-207

Hormones, plant, or auxins P-245e

Horn, Gunnar (born 1894), Norwegian Arctic explorer; in 1930 discovered remains of Andrée expedition finds photographs, picture P-286

Horn, or Hoorn, Philip de Montmorency, Count (1518-68), Flemish patriot B-254

Horn, Cape, most southerly point of South America, on island of the Fuegian Archipelago, maps C-206, S-208c, picture S-208h

distance from South Pole, map A-214

Horn, of animals H-338. See also in Index Antler

commercial uses H-338, M-97

distinguished from antlers H-338

shedding A-218, H-338

Horn, musical H-338-9

bugle B-262

sacred ram's horn, picture J-216

Horn'aday, William Temple (1854-1937), American zoölogist, born Plainfield, Ind.; director of New York Zoölogical Park 1896-1926; introduced legislation to protect and increase wild life ('The American Natural History'; 'Thirty Years' War for Wild Life'): H-313a

Hornbeam, a genus (*Carpinus*) of trees of the birch family, with very hard tough wood and smooth gray bark: also called American horn-

beam, ironwood, and blue or water beech.

Hornbill, a tropical bird H-339

partnership with rhinoceros R-94

Hornblende, a black or greenish-black mineral containing chiefly iron, calcium, magnesia, and alumina; found in crystals and granular masses; a common constituent of granite and other igneous rocks: M-184

Hornbook, primer used in English as late as time of George II; consisted usually of single leaf with alphabet in large and small letters, Lord's Prayer and Roman numerals set in wood frame and protected by transparent horn: pictures E-176, 165

'Horn Book', magazine L-163

Hornby, C. H. St. John (born 1867), English bookseller and amateur printer; educated at Oxford and called to the bar; printed privately (Ashendene Press) small editions of beautiful books; Dante (in folio) and 'Morte d'Arthur' are among masterpieces of modern printing.

Horne, Henry Sinclair Horne, first Baron (1861-1929), British general; went to Near East with Kitchener in 1914; commander of First Army 1916; rank of full general 1919, and made baron.

Horne, Sir Robert Stevenson (1871-1940), British politician; minister of labor and presiding officer National Industrial Conference 1919; president of Board of Trade 1920; chancellor of exchequer 1921-22.

Horned grebe G-151

Horned horse. See in Index Gnu

Horned lark L-65, color plate B-140

courtship flights B-125

nest, picture L-65

Horned owl O-257, pictures O-257, B-123

Horned pheasant, or tragopan, a brilliant bird of the Himalayas; has hornlike projection behind each eye; nests in trees.

Horned-poppo. See in Index Glaucium

Horned pont, or bullhead, a catfish C-100, F-74

Horned rattlesnake, or side winder R-52

Horned toad, a lizard L-171-2

protective coloration P-354

Horned viper V-303

Hornell', N.Y., manufacturing city and trade center on Canisteo River, 58 mi. s. of Rochester; pop. 15,649; silk, silk printing and dyeing; railroad shops: map N-114

Horn'net, a social wasp H-339, W-32

classified W-35

nest, picture P-57

'Hornet', Lawrence's ship L-74

Hornet-moth, metamorphosis I-92-3

Hornpipe, a dance F-135

Hornwort, an herb (*Ceratophyllum demersum*) of the family *Ceratophyllaceae*, growing under water; leaves divided into three threadlike rigid parts resembling a horn; used in aquaria.

Horo'logy, the science of measuring time. See in Index Clocks; Watches

Horo'scope, the position of the heavenly bodies at time of a person's birth, from which astrologers professed to predict the future Z-218

Horowitz (hō'rō-vits), Vladimir (born 1904), Russian pianist, born Kiev; captivated audiences in Europe and America through his brilliant technique and charming personality; début in United States 1928.

Horrid he'loderm, a poisonous lizard L-171

Horsa. See in Index Hengist and Horsa

Horse H-340-5

Arab H-343, pictures H-343, A-241

armored steeds, picture A-305

army, use in A-307c

bibliography H-313e

breeding regions: France F-175; United States H-345, K-11, 12, W-76, picture K-10

breeds H-342-4, pictures H-342-3, A-52

care and feeding H-344-5

circus horse, picture C-237f

color inheritance H-284

commercial products: cordovan leather L-85; hair L-196

domestication of: beginnings H-342, C-246; earliest uses H-342, T-121

evolution E-341, H-341, picture H-340; foot and hoof H-341, F-146, H-207, pictures H-340, F-147

homing instinct A-202

length of life, average, pictograph A-198

Mongolian M-222c

mythology: Centaur C-130-1; Japanese M-231; Pegasus P-100-1

poisoned by loco weed W-64-5

portrayed in art: painting, pictures P-14, A-311; sculpture, pictures S-54, 63, I-172, G-168

railroads for horse-drawn wagons R-36, 37, I-74g

related species: ass A-337-8; zebra Z-216

speed records H-344

training: cattle herding C-112-13; polo H-344, picture P-297

Horse ant, a wingless wasp W-35

Horseback riding, books about H-313c

Horse-bean, a tree. See in Index Jerusalem-thorn

Horse-car, a street-car drawn by horses S-306-7, pictures S-308, T-123

race with locomotive, picture L-178

Horse-chestnut, or buckeye, a tree B-258

leaves, pictures L-88, 89

Horse-chestnut family, or Hippocastanaceae (hīp-pō-kās-tā-nā'sē-ē), a family of shrubs and trees, native to the north temperate region, including the Ohio buckeye, yellow buckeye, California buckeye, common horse-chestnut, red horse-chestnut, woolly buckeye, dwarf horse-chestnut or bottlebrush buckeye, and Japanese horse-chestnut.

Horse family, or Equidae, a family of one-toed, hoofed animals with peculiarly ridged and hollowed teeth; includes horse, ass, and zebra.

Horse-fly, a two-winged fly of *Tabanidae* family; also called gad-fly; usually about 3 times size of housefly; has pointed proboscis; only females suck blood; males sip sweets from flowers.

Horsehair, uses of H-196

Spanish moss substitute A-95

Horsehair worm W-180b

Horsehaul. See in Index Elecampane

Horse latitudes, a zone of light winds between the trade wind and prevailing westerly zones W-112, chart W-113

Horse leech L-93

Horseless carriage, Haynes-Apperson, picture A-389

Horse mackerel, name given to several members of the mackerel family, particularly to the Atlantic tuna (*Thunnus secundodorsalis*) and to the blue-finned tuna of the Pacific (*Thunnus thynnus*).

Horsenettle, perennial plant (*Solanum carolinense*) of the nightshade family; native to North America; grows 1 to 4 ft., hairy, grayish with long yellow prickles; a common weed in waste places.

Horsens, Denmark, seaport on Fiord of Horsens, 32 mi. s.w. of Aarhus; pop. 30,000; iron products, ships, woodenware; exports butter and bacon.

Horse of Troy, story of T-143-4

Horsepower S-281, P-339
electric equivalent P-196
United States annual generation, picture W-50

Horse racing H-343-4

Horseradish C-2

Horseshoe Bend, in Tallapoosa River, 40 mi. n.e. of Montgomery, Ala.

Horseshoe Bend, battle of. *See in Index* Tallapoosa, battle of

Horseshoe crab, or king crab, a marine arthropod, having a horse-shoe shaped shell: T-141, picture C-389

Horseshoe Fall, the Canadian portion of Niagara Falls N-138

Horses of St. Mark's, a famous bronze group above main entrance to St. Mark's Cathedral in Venice I-172

Horse-stinger, dragon-fly, or darning needle D-88-90, pictures I-81, D-88, 89

fossils A-210

Horsetail family, or Equisetaceae (*ek-wi-sē-tā'sē-ē*), a family of plants of one genus, native to tropical and temperate regions, including scouring rushes or horsetails.

Horsetail rushes, or scouring rushes R-177

"Horsetails," clouds C-281

Horse-wrangler, on cattle ranch C-110

Hort'a, a city of the Azores, cap. of Fayal; pop. 8000; good harbor; fisheries; exports whale oil, fruit, wine, grain.

Horten'sian law (*lex Hortensia*), in Roman history R-132

Horthy (*hōr'tē*) de Nagybanya, Nicholas (born 1868), Hungarian admiral; elected regent of Hungary 1920; suppressed attempts of former King Charles to regain throne.

Horticulture, as vocation V-326. *See also in Index* Fruits and fruit growing; Gardens and gardening; Plants; Shrubs

Horton, England, Milton's home M-177

Horus (*hō'rūs*), Egyptian sun god, the son of Osiris and Isis; considered by the Egyptians as the god of light who overcame darkness, winter, and drought; identified with Greek Apollo; conquered Set to avenge the murder of Osiris temple, picture A-258

Hosain (*hō-sin'*), or Husein, grandson of Mohammed. *See in Index* Hasan and Husein

Hose, garden, manufacture R-168

Hosea (*hō-zā'ā*) (8th century B.C.), Hebrew minor prophet; wrote 28th book of Old Testament: P-352

Ho'siery, knitting machines K-31-3 nylon used for P-245l

Hos'mer, Harriet (1830-1908), American sculptor, born Watertown, Mass.; a classicist; invented several technical processes in connection with her art ('Puck'; 'The Sleeping Faun'; 'The Waking Faun').

Hosoda Eishi (*hō-sō-dā' ā-shē'*) (1746-1829), Japanese artist print, picture J-196a

Hosp'italers (Order of the Hospital of St. John of Jerusalem). *See in Index* Knights Hospitalers of St. John

Hospitals H-345

aid from gifts and endowments N-160

Army and Navy General Hospital, Hot Springs, Ark., picture A-298

Crusades (Hospitalers) C-406

foot-print identification F-43

hospital boat in Alaska A-106

management as a vocation V-323

Florence Nightingale N-145

nurses, training N-186, H-345

oldest in U.S. P-159

standardization of beds U-226

Host, in biology P-67-70, W-180a-b

Hosta (*hōs'tā*), or plantain-lily, formerly called funkia; hardy perennial, native to eastern Asia. Grows in clumps; leaves large, with prominent ribs; flowers in spikes, white or lilac; floret funnel-shaped, lives one day; also called day lily.

Host'age, a person or thing given by one of two conflicting parties to the other or seized as a pledge for carrying out the conditions of a treaty.

Hostels, overnight accommodations for travelers, especially student travelers. Youth hostels established in Germany 1910; in U.S. 1934 by the American Youth Hostels, Inc., with national headquarters at Northfield, Mass.; about 200 youth hostels in U.S.; conduct tours to Europe, Canada, Alaska, South America, and regional tours in U.S.: members travel mainly by bicycle, boat, or on foot.

Hostilius (*hōs-tī'l-i-ūs*), Tullus, Roman king R-129

Hostos y Bonilla (*ōs'tōs ē bō-nē'lyā*), Eugenio Maria de (1839-1903), Latin American writer L-67i

Hot air furnace H-264

Hotbed, in gardening G-7-8

Hotch'kiss, Benjamin B. (1826-85), American inventor, born Watertown, Conn.; worked in gun factory in youth; invented various kinds of guns and projectiles; famous for Hotchkiss machine gun.

Hôtel de Ville (*ō-tēl dü vėl*), French for town hall Brussels B-254

Ho'tien, also Khotan, Chinese Turkestan, trade city in s.w.; pop. 30,000: map A-332b bazaars A-328

"Hot" music, in jazz slang, the extreme form of swing music. *See also in Index* "Sweet" music

Hot-pack method, in canning C-75

Hot Springs, Ark., noted health resort in a valley of the Ozark Mts.; pop. 21,370; Army and Navy General Hospital: A-295, map A-296, picture A-298

Hot Springs, S. D., health resort and tourist town 45 mi. s.w. of Rapid City; pop. 4083; Bad Lands and Black Hills near by: map S-218

Hot springs, or thermal springs, in physical geography S-263

Hot Springs National Park A-295, N-15, 22a

Hotspur. *See* Percy, Sir Henry

Hot'tentots, race of South Africa now confined to w. Cape of Good Hope and adjoining territory A-39, S-200 racial affinity, diagram R-9b

Hot water heating H-264, 265

Hot-wire ammeter G-3

Houdin (*g-dāñ*), Robert (1805-71), French conjurer and prestidigitator M-32b, picture M-32a

Houdini (*hō-dē'nē*), Harry (originally Harry Weiss) (1874-1926), American magician and writer, born Appleton, Wis.; famed not only for his own remarkable tricks

but for exposing those of spiritualistic mediums and frauds ('Paper Magic'; 'The Right Way to Do Wrong'; 'Rope Ties and Escapes'): picture M-32d

Houdon (*g-dōñ*), Jean Antoine (1741-1828), French sculptor S-60, 62 statues of Washington R-107, pictures L-189, W-21

Houdry (*hō'drī*), Eugene J. (born 1893), French inventor; came to U.S. 1930 and became associated with Sun Oil Company oil refining process P-150

Hough (*hūf*), Emerson (1857-1923), American journalist and novelist, born Newton, Iowa; educated for law, but practised little; wrote realistic and historical novels of life in West ('The Mississippi Bubble'; 'Fifty-four Forty or Fight'; 'The Covered Wagon'; 'North of Thirty-Six').

Houghton (*hō'tōn*), Alanson B. (1863-1941), American diplomat, born Cambridge, Mass.; head Corning Glass Works; minister to Germany, 1922-25, to Great Britain, 1925-29.

Houghton, Daniel V-288

Houghton, Douglass (1810-45), American geologist, born Troy, N. Y.; professor at University of Michigan; discovered mineral resources of Michigan; drowned in Lake Superior at mouth of Eagle River; Houghton, Mich., named for him: M-194-5

Houghton, Stanley (1881-1913), English critic and dramatist, a leader in realistic movement ('Hindle Wakes').

Houghton, Mich., village opposite Hancock on Lake Portage, connected with Lake Superior by canal; pop. 3693; shipping point for Lake Superior copper region; Michigan College of Mining and Technology.

Houghton College, at Houghton, N.Y.; founded 1883 by Wesleyan Methodist church; arts and sciences, music, theology.

Hounds, hunting dogs D-79-80, 82, 83

Hounds-tongue. *See in Index* Chinese forget-me-not

Hour, why divided into 60 minutes B-5

Hour angle, in astronomy, the angular distance between the meridian of an observer and the hour circle through a celestial body at a given time.

Hour circles, in astronomy, half-circles, like meridians of earth traced through the sky, which pass through the celestial poles and cross the equator at right angles. They mark 24 hours, or one apparent revolution of the celestial sphere, from the circle through the point of the vernal equinox, much as longitude is measured from meridian of Greenwich. *See* Ascension, Right

Hour glass, or sand glass W-35, pictures W-38, 37

Houris (*hō'rēz*), in Mohammedan religion, beautiful maidens who minister to the faithful in Paradise.

Hours, or Horae, goddesses of law and order in mythology A-227

Hours of labor

agriculture: effect of machinery, pictograph A-50, picture A-51

China C-221c, L-93a

factories F-2

housewife L-93b

Japan J-188b

Russia R-194

2d World War N-12r

shorter hours L-44d, L-93a: Industrial Revolution aids I-74n, picto-

- graph I-740; Van Buren's influence V-271
sweatshop system S-334
- Housaton'ic River**, rises in Berkshires in w. Massachusetts, flows s. 155 mi. through Connecticut to Long Island Sound: map C-336
- House**, Edward Mandell (1858-1938), American political leader, born Houston, Tex.; confidential agent of President Wilson to European governments during World War; member American Peace Commission 1919: W-168
- House-boat**, covered flat-bottomed boat used as house or for cruising Chinese, life on C-79, C-216, A-330, pictures C-216, F-139
South Seas, picture P-4
- "House divided against itself cannot stand" L-142
- Housefly** F-128-9
bacteria spread by F-128, picture B-12
eggs, pictures F-129, E-193
eye, picture E-351
parasite of, picture P-69
- Household arts** H-325-9. See also in *Index* Home economics
- Household management** H-326, *Outline* H-329
- Houseleek**. See in *Index* Live-forever
- House of Commons**. See in *Index* Commons, House of
- House of Keys**, Isle of Man M-49
- House of Lords**. See in *Index* Lords, House of
- House of Representatives**. See in *Index* Representatives, House of
- "House of the Seven Gables", romance by Hawthorne H-248
- "House-raising" P-221f
- Houses**. See in *Index* Architecture; Shelter
- House snake**. See in *Index* Milk snake
- House-wren** W-181, color plate B-139
- Housing** S-110-14, *Outlines* H-328-9, S-185-6. See also in *Index* Shelter; Slums; Trailer, automobile building and loan association B-262 building suitable homes B-265-8 city problems S-114, C-241-2
England E-276: London slum clearance drive L-190-1
federal aid R-146f, B-265
wartime problem, N-12k
- Housing Administration**, Federal (FHA) R-146g, U-232
- Housing Authority**, Federal Public, U. S. U-232
- Housing Authority**, United States (USHA) B-265, picture R-146m
- Housing Agency**, National (NHA) R-146g, U-232
- Hous'man**, Alfred Edward (1859-1936), English poet and scholar; professor of Latin, Cambridge; editor of classical works and author of 'A Shropshire Lad' and 'Last Poems', the former his best known work—a book of delicate, lyrical poems expressing exquisite sensitivity to life's beauty and cruelty place in literature E-289
quoted P-269
- Housman**, Laurence (born 1865), English writer and illustrator, brother of A. E. Housman; wrote children's stories ('What O'Clock Tales'), novels ('An Englishwoman's Love Letters'), plays ('Little Plays of St. Francis' and 'Victoria Regina'), reminiscences ('The Unexpected Years'), and poetry ('Green Arras' and 'Spikenard'); illustrated Shelley's 'Sensitive Plant' stories S-303c
- Houston** (hūs'tūn), Sam (1793-1863), American soldier and statesman, president of republic of Texas H-346, A-367
memorial day for (March 2) H-320
Houston, Tex., largest city of state, 50 mi. n.w. of Galveston Bay; pop. 384,514: H-346, map T-56
ship canal H-346, picture T-57
- Houyhnhnms** (whin'mz), in 'Gulliver's Travels' S-343, picture S-344
- Hov'as**, tribe of Madagascar M-18
- Hove**, town in Sussex, England, adjoining Brighton; pop. 51,000; forms part of famous Brighton promenade.
- Hovenweep National Monument**, Utah-Colo. N-22a
- Hover-fly** I-92, 93
- Hovey**, Richard (1864-1900), American poet, born Normal, Ill. ('Launcelot and Guenevere'; with Bliss Carman, 'Songs from Vagabondia') quoted N-123
- Howard**, great English family, whose head is the Duke of Norfolk, first duke and earl marshal of England, and whose branches hold many other peerages; rose to greatness and misfortune in Tudor reigns.
- Howard**, Bronson (1842-1908), American dramatist, born Detroit, Mich. ('The Henrietta'; 'Shenandoah').
- Howard**, Catherine (1520?-42), 5th queen of Henry VIII of England beheaded H-278
- Howard**, John (1726-90), English philanthropist and prison reformer; remedied shocking abuses: P-350
- Howard**, John Eager (1752-1827), American Revolutionary officer, born Baltimore County, Md.; fought at Germantown, Monmouth, Cowpens, Eutaw Springs; governor of Maryland 1789-92; much of land he owned now in city of Baltimore.
- Howard**, Leslie (1893-1948), English actor, playwright, producer, born London; New York debut 1921; stage successes 'Her Cardboard Lover', 'Berkeley Square', 'Petrified Forest'; in motion pictures after 1930 ('Of Human Bondage', 'Petrified Forest', 'Pygmalion').
- Howard**, Luke (1772-1864), English scientist; invented first generally accepted system of cloud nomenclature.
- Howard**, Oliver Otis (1830-1909), American Civil War general, commissioner of Freedmen's Bureau 1866-72; instrumental in establishing Howard University for Negroes, its president 1869-73; founded Lincoln Memorial University for mountain whites at Cumberland Gap, Tenn.
- Howard**, Sidney Coe (1891-1939), American playwright, born Oakland, Calif.; did journalistic work in New York; with Paul de Kruif wrote 'Yellow Jack', a play about the fight against yellow fever; plays are clever and of varying types ('They Knew What They Wanted', won Pulitzer prize; 'The Silver Cord'; 'Half Gods').
- Howard** of Effingham, Charles Howard, 2d Baron (1536-1624), created Earl of Nottingham 1596; English lord high admiral; influential with Queen Elizabeth, his kinswoman Spanish Armada A-301
- Howard** of Penrith, Esme William Howard, first Baron (1863-1939), English diplomat; served in Ireland, Italy, Crete, Hungary, Switzerland, Sweden, and Spain; ambassador to U.S. 1924-30.
- Howard College**, at Birmingham, Ala.; founded 1842 by Baptist church; arts and sciences.
- Howard University**, at Washington, D. C., for Negroes; founded 1867; non-sectarian; liberal arts, applied science, education, medicine, dentistry, pharmacy, law, theology, music.
- How'dah**, box for riding elephant E-249
- "How Do You Like Your Neighbor?" game P-250
- Howe**, Edgar Watson (1853-1937), American author and editor, born Treaty, Ind.; editor Atchison (Kan.) *Daily Globe* 1877-1911; editor *E. W. Howe's Monthly* after 1911 ('The Story of a Country Town'; 'Plain People').
- Howe**, Elias (1819-67), inventor of the sewing machine H-346-7, S-93, picture I-115
- Howe**, Frederic Clemson (1867-1940), public official, professor of law, born Meadville, Pa.; consumers' counsel, Agricultural Adjustment Administration, 1933-35; became special adviser to Secretary of Agriculture, 1935 ('The City, the Hope of Democracy'; 'Revolution and Democracy').
- Howe**, Joseph (1804-73), Canadian statesman, journalist, orator, born Halifax, Nova Scotia; premier of Nova Scotia 1860-3; strong opponent of Confederation, but after it was secured accepted position 1867-73 in first cabinet
Tupper opposes T-155
- Howe**, Julia Ward (1819-1910), American writer and reformer, born New York City; wife of Samuel Gridley Howe; vigorous and brilliant leader in many philanthropic causes and pioneer in woman suffrage movement ('Sex and Education'; 'Modern Society'; 'Margaret Fuller', biography; 'Reminiscences'); picture N-27
'Battle Hymn of the Republic' N-24 forms woman's club W-131
- Howe**, Richard, Earl (1726-99), English admiral; commanded British sea forces in American Revolution; relieved Gibraltar 1782; gained victory of "glorious first of June" 1794 over French off Ushant.
- Howe**, Samuel Gridley (1801-76), pioneer educator and reformer, born Boston, Mass.; founder and first superintendent of the Perkins Institution for the Blind; founder of the first school in the U.S. for idiots and the feeble minded
teaches Laura Bridgman B-156
- Howe**, Sir William (1729-1814), British general, younger brother of Richard, Earl Howe; commander in chief of British land forces in North America 1775-78
battle of Long Island L-195
condemns Nathan Hale H-199
part in Revolutionary War R-89, 90
proposes peace, picture R-92
- Howe**, William Henry (1846-1929), American animal painter born Ravenna, Ohio; known especially for his landscapes with cattle ('Return of the Herd'; 'Cattle at Rest').
- How'ell**, Clark (1863-1936), American journalist, succeeded Henry W. Grady as managing editor 1889 (editor in chief after 1897) of the *Atlanta Constitution*, which he maintained as one of the leading papers of the South; served several terms in Georgia legislature; member of Democratic National Committee 1892-1924, 1936
- Howells**, John Mead (born 1868), American architect, born Cambridge, Mass.; son of William Dean Howells; designer of buildings for

- Columbia, Harvard, and Yale universities; in association with Raymond M. Hood designed Tribune Tower, Chicago.
- Howells, William Dean** (1837-1920), famous American novelist, essayist, and critic H-347-8, A-180, *picture* A-179
- Howitt, William** (1792-1879), and **Mary** (1799-1888), English authors; husband and wife; wrote prose and verse in collaboration ('The Forest Minstrel'); also independently.
- Howitzer**, a piece of artillery firing at elevations higher than a field gun but lower than a mortar A-307b, A-319, *pictures* W-165, A-319
- Howland Island**, a tiny sand and coral island in the Pacific, about 1900 mi. s.w. of Honolulu; colonized by the U. S. in 1935 as a way-station for land planes flying from the Hawaiian Islands to Australia; airport built there in 1937: *map* P-10c
- Howler monkey** M-228, *picture* M-227
- "How Many Miles to Babylon?" game P-251, *picture* P-251
- Howrah**, industrial and railroad center, suburb of Calcutta, India, separated from it by Hooghly River; pop. 225,000; jute, cotton, iron, and machinery manufactures: *map* A-332c
- Hoxie, Vinnie Ream** (1847-1914), American sculptor, born Madison, Wis.; commissioned by Congress to make statues of Lincoln and Sequoyah (in U. S. Capitol) and Farragut statue in Washington; first woman sculptor to receive a commission from U.S. government.
- Hoy** (Norse, "high island"), 2d in size (53 sq. mi.) of Orkney Is. O-251
- Hoyle, Edmond** (1672-1769), English author of rules of whist and other games, long regarded as authoritative, so that "according to Hoyle" has become a proverbial phrase.
- Hradec Králové**, Bohemia. *See in Index* Königgrätz
- Hrdlicka** (*hŭrd-lĕch'kà*), Ales (1869-1943), American anthropologist, born in Bohemia; authority on Indians; curator U.S. National Museum; founder *American Journal of Physical Anthropology*.
- Hrofl, or Rolf**. *See in Index* Rollo
- Hrozny** (*hrôz'nĕ*), Friedrich (born 1879), Czech orientalist; placed Hittite language in Indo-European group; professor of cuneiform research and ancient oriental history at Charles University of Prague: H-312
- Hruotland**, Count, or Roland, hero of Charlemagne's army, celebrated in medieval legend R-126, S-303i, o
- Hsia** (*shĕ'á*) dynasty (about 2200 B.C.), China C-221i
- Hsingan** (*shĭng'än'*), Mongol provinces in w. Manchukuo; pop. over 1,000,000: M-51, *map* M-49a
- Hsinking** (*shĭn'ching'*), Manchukuo, capital of Manchukuo, formerly called Changchun; in Kirin province, about 300 mi. from the coast, midway on the railroad connecting Harbin and Mukden; pop. more than 400,000: M-50, *maps* M-49a, A-332b
- H. Sophie Newcomb Memorial College for Women**. *See in Index* Newcomb College
- Hsuan-tung**. *See in Index* Pu-yi
- Hsu-Shih-Chang** (*shŭ shĕ chāng*) (born 1853), Chinese statesman, elected 1918 president of Chinese republic, resigned 1922.
- Huarizo** (*wă-rĕ'thō*), South American fur-bearing hybrid animal, a cross between a male llama and a female alpaca.
- Huasco**, Chile, port about 360 mi. s. of Antofagasta; pop. 3000: C-207a, *map* C-206
- Huaso** (*hŭă'sō*), Chilean "cowboy," *picture* C-207d
- Huastec**, or **Huastec** (*wă'stĕk*), a tribe in s. Mexico along Gulf of Mexico, said to be an offshoot of Mayans carving, *picture* A-147
- Hub**, of wheel W-84b
- Hubay** (*hŭ'bî*), Jeno, or Eugen (1858-1937), Hungarian violinist and composer, born Budapest; pupil of his father and of Joachim; work includes operas ('The Violin Maker of Cremona'; 'Anna Karenina'), concertos, symphonies, songs.
- Hubbard, Bernard Rosecrans** (born 1888), American Jesuit, scientist, and lecturer, born San Francisco; professor of geology, University of Santa Clara, Santa Clara, Calif., after 1926; noted for geological explorations in Alaska ('Mush You Malemutes!').
- Hubbard, Elbert** (1859-1915), American writer, born Bloomington, Ill.; founded and edited *The Philistine*, "a magazine of protest"; founded Roycroft Shop, East Aurora, N. Y.; ('Little Journeys'; 'Message to Garcia').
- Hubbard, Frank McKinney** ("Kin Hubbard") (1868-1930), American caricaturist and humorous writer, born Bellefontaine, Ohio; on *Indianapolis News* after 1891 ('Abe Martin's Sayings').
- Hubbard, Leonidas, Jr.** (1872-1903), American journalist and explorer; with Dillon Wallace in 1903 journeyed 250 mi. farther in Labrador interior than former white explorers; died from exposure.
- Hubbard squash** S-265
- Hubble, Edwin Powell** (born 1889), American astronomer, born Marshfield, Mo.; at Mount Wilson Observatory 1919- ("Realm of the Nebulae"): N-61
- Huber** (*ŭ-bĕr*), François (1750-1831), Swiss naturalist, first to gain scientific knowledge of the life of bees.
- Huberman** (*hŭ'bĕr-măn*), Bronislaw (born 1882), Polish violinist; beginning 1892, had world-wide success as virtuoso; founded Palestine Symphony Orchestra 1935.
- Hubert** (*hŭ'bĕrt*), Saint (died 727), apostle of the Ardennes and patron of huntsmen; festival November 3.
- Hubertsburg**, or **Hubertusburg**, Peace of, signed 1763 in chateau of Hubertusburg in Saxony, Germany, ending Seven Years' War S-84
- Hüb'nerite**, a tungsten ore T-150
- Hue'bald**, or **Hubaldus** (about 840-930), Benedictine monk, writer, and musician, born near Tournai; wrote lives of saints; best known for works on music; considered pioneer in writing for several voice parts.
- Huch** (*hŭk*), Ricarda (born 1864), German poet and novelist; opposed naturalism; outstanding as critic and as historical novelist ('Defeat', 'Victory', historical romances of Garibaldi; 'The Deruga Trial').
- Huck**, or **huckaback**, toweling of linen, or cotton with small woven design; durable, absorbent; word derived from the fact that English huckster or peddler carried wares on his back.
- Huckleberry**, a blueberry B-159
- Huckleberry Finn**, hero of Mark Twain's novel of same name, a reckless boy who, resenting the restraint of civilization, runs away from home with his friend, Tom Sawyer, the two becoming involved in a series of lively incidents connected with slavery troubles before the Civil War: T-169
- Hud'dersfield**, England, manufacturing town 25 mi. n.e. of Manchester; pop. 114,000; wool cloth center: *map* E-270a
- Hudibras** (*hŭ'di-brās*), hero of a mock epic poem of that name by Samuel Butler; satire on Puritanism.
- Hudson, Henry** (1575?-1611), English navigator H-348, P-280
- Delaware Bay P-116, D-39
- explores Hudson River H-348, N-116, 118
- flag F-99, *color plate* F-90
- lands on Coney Island C-329
- place in American exploration A-146
- voyages, *map* A-143
- Hudson, Henry Norman** (1814-86), American Episcopal clergyman and Shakespearean scholar, born Cornwall, Vt.
- Hudson, W. H.** (1841-1922), English naturalist and romancer; Galsworthy called him "a simple narrator who is well-nigh unsurpassed, a stylist who has few, if any, living equals" ('The Purple Land'; 'Green Mansions'; 'The Naturalist in La Plata'; 'Far Away and Long Ago').
- Hudson, N.Y.**, port of entry on e. bank of Hudson River, 28 mi. s. of Albany; pop. 11,517; cement, knit goods, machinery, matches; once important foreign and whaling port: *map* N-114
- Hudson Bay**, Canada, the 3d largest land-locked sea in the world H-348, *maps* C-50b-c, C-58. *See also in Index* Ocean, *table*
- discovery and exploration H-348
- importance to Canada C-51
- Radisson finds old forts F-224
- Hudson Bay Railway** C-51, H-348
- Hudson Bay sable** S-157
- Hudson River**, principal river of New York State, and one of the most important highways of commerce in U.S. H-350, *map* N-114, *picture* N-115
- George Washington Bridge, B-240b, *pictures* N-91, N-127, W-120
- highway to the west U-183, N-118
- steam navigation begins F-217
- "tubes" or subways, *pictures* T-152, 153; Holland tunnel, *picture* N-131
- Hudson River School**, of American painters P-27
- Hudson's Bay Company**, British trading company in Canada H-350, M-54
- competition with U.S. F-226-7
- fur trade H-348, F-225-7, T-127, *pictures* T-129, F-228
- Northwest Territories N-170
- office in London L-186
- Oregon country posts O-247-8: Fort Boise I-9-10
- origin and growth F-224-7
- Hudson seal**, muskrat fur M-325
- Hudson Strait**, connects Hudson Bay with Atlantic H-348, *map* C-50b-c
- Hué** (*ŭ-ă'*), fortified city, cap. of Annam, French Indo-China; pop. 33,000, on Hué River, 10 mi. from mouth: I-73d, *maps* I-73b, A-332c
- Hue**, in color C-308d, e, *color chart* C-308c
- Hue and cry**, old English common-law practise of pursuing criminal with "horn and voice" ("hue" from old French verb *huer*, to cry or shout).
- Huenefeld** (*hŭ'nŭ-fĕlt*), Gunther von, Baron, German aviator
- nonstop flight, Europe to America, *picture* A-73, *table* A-74

Key—cāpe, āt, fār, fāst, whāt, fāll; mǎ, yĕt, fĕrn, thĕre; ĭce, bĭt; rōw, wón, fór. nŏt, dŏ; cūre, bŭt, rŭde, fŭll, bŭrn;

Huerta (*woér'tä*), Victoriano (1854-1916), Mexican general, full-blooded Indian; overthrew Madero administration and made himself president 1913; suspected of authorizing Madero's murder 4 days later; was refused recognition by the U.S.; resigned 1914; arrested in U.S. for fomenting a revolution against Mexico; died before trial: M-142e

Huey P. Long Bridge N-100, picture B-240a

Hug'gins, Sir William (1824-1910), English astronomer, pioneer in spectroscopic astronomy; introduced spectroscopic photography into astronomy: N-60

Hugh, Saint (1024-1109), abbot of Cluny, born Sémur, France; adviser of several popes; aided in reform of clergy; raised Abbey of Cluny to place of highest importance, amalgamating other monasteries; festival April 29.

Hugh Capet. See in *Index* Capet, Hugh

Hughes, Charles Evans (born 1862), American lawyer and statesman; chief justice of U. S. Supreme Court (1930-41): H-350-1

Theodore Roosevelt supports R-153 Washington naval conference H-219

Hughes, David Edward (1831-1900), American inventor, born England; invented the printing telegraph, the microphone, and the induction balance.

Hughes, Howard Robard (born 1905), American capitalist and aviator, born Houston, Tex.; established airplane speed records 1935-38: table A-74

Hughes, (James) Langston (born 1902), Negro poet, born Joplin, Mo.; his ability as a poet discovered by Vachel Lindsay when Hughes was working as a hotel busboy; his poetry deals with humble aspects of Negro life ('The Weary Blues'; 'Fine Clothes to the Jew'; 'Not Without Laughter', a novel; 'The Big Sea', autobiography).

Hughes, John J. (1797-1864), Roman Catholic prelate, born County Tyrone, Ireland; bishop of New York 1842-51, archbishop after 1851; nationally prominent because of humanitarian work, interest in political welfare of his parishioners, writings in defense of Catholicism.

Hughes, Rupert (born 1872), American editor and writer, born Lancaster, Mo.; wrote books on music, biographies, stories, novels, plays ('The Fairy Detective'; 'The Cup of Fury'; 'Souls for Sale'; 'Stately Timber'; 'Excuse Me'); his 'George Washington' sought to strip the hero of myth and show him as human being.

Hughes, Sir Sam (1853-1921), Canadian soldier and political leader H-351

Hughes, Thomas (1822-96), English author and social reformer, founder of an experimental coöperative colony at Rugby, Tenn.; his book 'Tom Brown's School Days' did much to fix ideals of English public schools; also author of 'Tom Brown at Oxford' and 'Life of Alfred the Great'.

Hughes, William Morris (born 1864), Australian statesman and labor leader, born Wales; prime minister, 1915-23; known as imperialist because of stern war measures and attitude at Peace Conference 1919.

Hugh of Lincoln, Saint (1140?-1200), bishop of Lincoln; born Avalon, France, of noble family; called to England by Henry II to establish

English Carthusian monastery; festival November 17. Another St. Hugh of Lincoln was an English boy said to have been put to death by Jews at Lincoln in the 13th century; festival July 27

Huginn' (*hū-gin'*), in Norse mythology, one of ravens of Odin, picture O-203

Hugli (*hūg'li*), or Hooghly, the westernmost channel in Ganges delta G-5

Hugo, Joseph Leopold, father of Victor Hugo H-352

Hugo (*hū'gō*, French *ü-gō'*), Victor Marie (1802-85), French writer H-352-4

books by and about H-353 drama basis of 'Rigoletto' O-232

dramatist and poet, estimate H-353 leader of Romanticists H-353

'Les Misérables' H-353-4

quoted on architecture A-257

Huguenots (*hū'gē-nōts*, French *ü-gē-nō'*), French Protestants of 16th and 17th centuries H-354

American colonies A-160, 161, A-145, H-354; Florida F-110

Coligny C-300

colony in South Africa S-199

Henry II begins persecution H-278

Henry of Navarre and the Edict of Nantes H-279

Richelieu crushes R-106

St. Bartholomew's Massacre C-300

spread industries in w. Europe S-145

'Huguenots, The', opera by Meyerbeer

story O-230: basis for H-354

Hulagu Khan (*hū-lū'gō kân*) (died 1265), Mongolian leader, first independent ruler of Persia M-223

Hull, Cordell (born 1871), statesman, born Pickett Co., Tenn.; member U. S. Congress 1907-21, 1923-31; U. S. senator 1931-33, secretary of state after 1933; advocate of free trade: R-146r, picture R-146q

Pan American relations L-67p

world court W-179j

Hull, Isaac (1773-1843), American commodore who gained first American naval victory in War of 1812 commands *Constitution* W-10

Hull, John (1624-83), American silversmith A-175

Hull, William (1753-1825), American Revolutionary officer, general in War of 1812; surrendered Detroit to British 1812; court-martialed and sentenced to be shot, but pardoned by President Madison

Fort Dearborn evacuation C-192

Hull, officially Kingston-upon-Hull, seaport in n.e. England on Humber River; pop. 315,000; naval arsenal; fisheries; commerce: maps E-279, E-270a

Hull, industrial city in s.w. Quebec opposite Ottawa, Ontario; pop. 29,433; lumber products, matches, pulp, paper, packed meats, cement, clothing: O-254, map C-50c

Hull, of sailing craft

battleship N-54-5

motor boats B-165

sailboat types B-164

ship S-127, picture S-121

Hull House, famous social settlement in Chicago A-17

Human behavior. See in *Index* Behavior, human

Human body. See in *Index* Physiology; Anatomy

'Human Comedy, The', name given to a series of novels by Balzac B-35

Humane Societies, organizations for the prevention of cruelty to animals and children H-354

Human geography, study of earth as the home of man G-34, 35, S-184

Humanism, the movement at the close of the Middle Ages that brought about a revival of classical learning and tastes; also a modern literary and philosophical movement opposed to modernism

Chaucer poet of C-159-60

history of movement E-173-4

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Renaissance E-173, R-74

Humanistic handwriting B-177-8

Humanities, in education E-173

Human Nutrition and Home Economics, Bureau of, U. S. H-325, U-228

Human resources, conservation of C-343-344, *Outline* C-345

Human society, study of S-182-8. See also in *Index* Sociology

'Human Ten Pins,' game P-257

Humber River, estuary formed by Trent and Ouse rivers in n.e. England, maps E-279, E-270a

Hum'bert I (1844-1900), king of Italy; succeeded 1878; popularly called Humbert the Good because of courage and generosity in plague and earthquake; fostered Triple Alliance and inaugurated policy of colonial expansion

assassinated I-158

street in Rome named for R-144

Humblebee, or bumblebee B-73, 76-7, color plates W-32a-b, B-76a

pollinates red clover C-281

Hum'boldt, Alexander, Baron von (1769-1859), German naturalist, explorer, founder of modern science of physical geography ('Kosmos').

Humboldt, Karl Wilhelm, Baron von (1767-1835), German philologist, statesman, and writer, first to define philosophy of speech; brother of Alexander von Humboldt.

Humboldt Current. See in *Index* Antarctic Current

Humboldt Lake, or Humboldt Sink, in w. Nevada; 20 mi. long; receives Humboldt River; has no outlet; usually only a marsh, becoming a lake at certain seasons: map N-77

Humboldt River, rises in n.e. part of Nevada, flows 375 mi. into Humboldt Lake (or Sink): map N-77

Hume, David (1711-76), British philosopher, historian, and political economist ('Inquiry Concerning Human Understanding'; 'History of England').

Hume, Samuel (born 1885), American play producer, born San Francisco; associated with Edward Gordon Craig; organized first exhibition of stagecraft in United States.

Hume Dam, in Australia, table D-357

Hu'merus, bone of the upper arm S-156

Humid'ity, moisture content of air E-339

air conditioning H-266

automatic regulation A-385

cotton mill regulation C-378

houses: getting healthful, moist air H-264; proper degree W-148

hygrometer measures H-377

trees affect T-131

'Humility', a Little Talk by Arthur Mee H-355

Hummingbird H-356, pictures H-356, color plate B-136

courtship, picture B-126

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feathers, cause of iridescence F-21

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Humor. See also in *Index* Comedy; Parody; Satire

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ancient Greek drama D-92-3

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conversational C-347b

Humors, of the eye E-349

- Hump**, or gravity yard, in railway switching R-44
- Humpback salmon** S-13
- Humpback whale** W-78, *picture* W-79
- Humped ox**, or zebu Z-216, C-102, 105
- Humperdineck** (*hym'pér-dingk*), Engelbert (1854-1921), German composer; closely associated with Wagner, whom he assisted in producing 'Parsifal'; made effective use of folk themes; well known for opera 'Hänsel and Gretel'.
- Humphrey, Doris**, modern dancer and choreographer, born Oak Park, Ill.; studied with Ruth St. Denis and Ted Shawn; with Charles Weidman opened school in New York City 1927; important work at Bennington College, Vermont.
- Humphrey of Gloucester**. *See in Index* Gloucester, Duke of
- Humphreys, David** (1753-1818), American soldier and minor poet of the Revolution, born Derby, Conn.; aide-de-camp to Washington; minister to Portugal and Spain introduces Merino sheep A-53
- Humphreys, Joshua** (1751-1838), American shipbuilder, born Pennsylvania; outstanding naval architect; U.S. naval constructor 1794-1801: N-56e
- Humphreys Peak**, highest peak of San Francisco Mountain; 12,611 feet; in Coconino County, Ariz.; highest point in state.
- Humulus**, genus of hops H-338.
- Humus** (*hū'mūs*), soil S-191a flood control F-106c, d
- Hun**. *See in Index* Huns
- Hunan'**, an inland province of China; 91,595 sq. mi.; pop. 28,295,000; cap. Changsha; immense coal and iron deposits; one of chief tea-producing regions of the world: *map* C-212
- 'Hunchback of Notre Dame'**. *See in Index* 'Notre Dame de Paris'
- 'Hundley'**, early submarine S-314
- Hundred**, a territorial unit of government
- Delaware D-41
- England D-46
- Hundred Days**, period between Napoleon's return to Paris from Elba, March 20, 1815, and the restoration of Louis XVIII, June 28: N-10, L-203
- Hundred-handers** (Hecatoncheires), giants in Greek mythology U-261
- Hundredweight**, a unit of measure, *table* W-67
- Hundred Years' War** (1337-1453), between England and France H-357-9
- archery H-357, 358, A-46, *pictures* H-357, 359
- battle of Agincourt A-46, H-358: Henry V at, *picture* H-277
- battle of Crécy H-357
- capture of Calais C-18
- Charles VII ends C-152
- Estates-General, rôle of E-304
- Froissart's 'Chronicles' F-209
- Joan of Arc J-219-20, *pictures* C-151, H-359, J-219, 220
- Huneker** (*hūn'ē-kēr*), James G. (1860-1921), American musical, literary, and dramatic critic, born Philadelphia; did more than any other man of his day to familiarize the U.S. with the best contemporary European literature ('Mezzotints in Modern Music'; 'Iconoclasts'; 'Egoists'; 'Unicorns'; 'Steeplejack').
- Hungarian**, or Magyar, language H-360-1
- Hungarian partridge** Q-1
- Hungarian pigeon**, *picture* P-217
- 'Hungarian Rhapsodies'**, musical compositions by Liszt L-156, G-90
- Hun'gary**, a kingdom in s. cent. Europe; about 72,500 sq. mi.; pop. 14,000,000; cap. Budapest: H-360-2, A-381, *maps* A-381, E-326d-e, f, *Outline* A-383
- agriculture H-360, A-381
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- Otto I defeats Magyars O-256, H-361
- Hapsburg claim established by Frederick III F-162
- Turks conquer T-162
- Kossuth and Revolution of 1848 K-40-1
- Dual Monarchy formed H-361, A-383
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- music, gipsy origin G-90
- national hymn N-25
- products H-360, 361
- Hungary, University of B-258
- Hung Wo**. *See in Index* Chu Yüanchang
- Hunnemannia** (*hūn-nē-mān'ni-á*), a genus of perennial plants of poppy family, native to desert regions of Mexico. Leaves covered with a "bloom"; flowers like California poppy, yellow; also called bush escholtzia, Mexican tulip-poppy, golden-cup, Santa Barbara poppy.
- Huns**, barbarian people of central Asia who invaded Europe in 4th and 5th centuries H-362
- nomadic character M-158
- racial affinity, *diagram* R-9b
- Huns, White**, or Ephthalites, tribe of central Asia living near Oxus in 5th and 6th centuries
- invade India I-38
- Hunt, Clara Whitehill** (born 1871), American librarian and author, born Utica, N. Y.; superintendent, children's department, Brooklyn Public Library; writer of children's books depicting American home life ('What Shall We Read to the Children?'; 'About Harriet'; 'Peggy's Playhouses').
- Hunt, Holman** (1827-1910), English Pre-Raphaelite painter ('The Light of the World'; 'Finding of Christ in the Temple'): P-23
- Hunt, Leigh** (1784-1859), English poet and essayist, friend of Byron, Keats, and Shelley ('Abou Ben Adhem'; 'Autobiography').
- Hunt, Mabel Leigh** (born 1892), author of children's books; born Coatesville, Ind.; her Quaker ancestry and her mother's memories of Civil War days are used as background ('Lucinda, a Little Girl of 1860'; 'Little Girl with Seven Names'; 'Benjie's Hat'; 'Little Grey Gown').
- Hunt, Richard Morris** (1828-95), American architect; designed pedestal for Bartholdi's 'Liberty', Administration Building of Chicago World's Fair 1893, and many other notable structures; established earliest American training school of architecture.
- Hunt, Walter** (1792?-1859), American inventor in 1834 of first practical sewing machine S-92-3
- Hunt, William Morris** (1824-79), American painter; brother of Richard Morris Hunt: P-27
- Hunt, Wilson Price** (1780?-1842), American fur trader and explorer; led expedition of Astor's Pacific Fur Company overland from St. Louis to Astoria, at the mouth of the Columbia River (1810-12); explored land and established trading posts
- Idaho expedition I-9
- South Dakota traversed S-219
- Hunter, John** (1728-93), British physiologist and surgeon, born Glasgow, Scotland; one of world's greatest anatomists; work led to notable advances in surgery; introduced experiment into study of physiology; buried in Westminster Abbey.
- Hunter, Robert Mercer Taliaferro** (1809-87), Confederate secretary of state (1861) and peace commissioner (1865); born Essex County, Va.; member of Congress 1837-43 and 1845-47; in senate 1847-61.
- Hunter College of the City of New York**, established 1870 as Normal College (name changed 1914); for women; only residents of city admitted; liberal arts; also model kindergarten, elementary school, and high school.
- Hunter's fire**, or trapper's fire C-47
- Hunter's moon**, the full moon after the harvest moon (the moon nearest the autumnal equinox).
- Hunting**
- Assyrian (ancient), *picture* B-6
- boar B-160
- camera N-36, *pictures* N-28, 29, 32, 36
- dumdum bullets used F-52
- elephant E-249, 250, *picture* E-248
- Eskimo customs E-303, *pictures* E-302
- falconry F-7, H-246, *picture* H-247
- horns used H-339
- lion, among Kafirs, *picture* L-154
- opossum O-235
- primitive people engage in F-9-10
- quail Q-1
- rhinoceros R-95
- safari in Africa, *picture* A-39
- seals, *picture* E-302
- shotguns used F-52-3
- tiger E-249-50
- Hunting dogs** D-79-81, 82, 83
- suitable for house dogs D-84
- Hunt'ingdonshire**, a small inland county in e. England; 366 sq. mi.; pop. 56,000; cap. Huntingdon.
- Hunting leopard**, or cheetah L-98a
- Hunting spider**, *picture* S-254
- Huntington, Anna Hyatt**. *See in Index* Hyatt, Anna Vaughn
- Huntington, Collis P.** (1821-1900), American capitalist, one of chief promoters of Central Pacific, Southern Pacific, and Chesapeake and Ohio railroads.
- Huntington, Ellsworth** (born 1876), American geographer and explorer, born Galesburg, Ill.; research associate, Yale University; went on many expeditions into Asia; made particular studies of climatic variations and weather changes ('The Pulse of Asia'; 'The Climatic Factor'; 'The Human Habitat') clues to past droughts D-113a
- studies in U.S. climate C-271
- Huntington, Henry Edwards** (1850-1927), American railway official and art collector, born Oneonta, N.Y.; bequeathed to public his estate in San Marino, Calif., with one of finest collections of art, English manuscripts and Americana in world.

Huntington, Samuel (1732-96), signer of Declaration of Independence; born Windham, Conn.; governor Connecticut (1786-96).

Huntington, Ind., manufacturing city on Little Wabash River, 23 mi. s.w. of Fort Wayne; pop. 13,903; lime, iron and steel products, shoes, rubber goods; Huntington College.

Huntington, N. Y., residential area in n. Long Island, 35 mi. from New York City; includes West Hills, birthplace of Walt Whitman.

Huntington, W. Va., largest city of state; on Ohio River; 45 mi. w. of Charleston; pop. 78,836; r.r. shops; glass, iron, clay, and wood products; Marshall College: map W-76

Huntington Library. *See in Index* Henry E. Huntington Library and Art Gallery

Huntington Park, Calif., residential suburb and manufacturing city 10 mi. s.w. of Los Angeles; pop. 28,648; truck farming, citrus fruit growing, poultry raising; auto supplies, furniture, steel, iron.

Huntsman, Benjamin (1704-76), English inventor and steel manufacturer S-106

Huntsville, Ala., city 85 mi. n. of Birmingham; pop. 13,050; farming and stock raising; textiles, cottonseed oil, lumber; State Agricultural and Mechanical College (for Negroes): A-98b, 99, map A-98 Monte Sano State Park A-98b

Huntsville, Tex., city 70 mi. n. of Houston; pop. 5108; cotton trade; state penitentiary; teachers college.

Hunyady (*hūn'yū-dē*), Janos, or John (1387?-1456), national hero of Hungary, great warrior and statesman; by his defense of Belgrade against the Turks in 1456 made Hungary independent for 70 years: H-361, T-162

Hupa, an Athapascan Indian tribe of n. California, noted for fine basketry and elaborate costumes.

Hupé (*hū'pē*'), province of central China; 80,190 sq. mi.; pop. 25,540,000; important iron deposits; Hankow center of China's iron and steel industry; cotton, silk, tobacco, timber; cap. Wuchang: map C-212 Japanese control C-221o

Hurd, Peter (born 1904), painter, born Roswell, N.M.; studied with N. C. Wyeth and married his daughter Henriette, also a painter; especially noted for scenes of American Southwest.

Hurdling, racing on foot over short distances in which ten hurdles, or light movable fences, have been placed; competitor disqualified if three or more hurdles are upset, or if he trails his leg or foot alongside any hurdle.

Hurley, Edward Nash (1864-1933), manufacturer, born Galesburg, Ill.; chairman U.S. Shipping Board and president Emergency Fleet Corporation 1917-19.

Hurley, Patrick Jay (born 1883), lawyer, statesman, and U.S. Army officer, born Choctaw Nation in present state of Oklahoma; attorney for Choctaw Nation 1912-17; served in 1st World War; helped organize U. S. Chamber of Commerce 1912; U. S. secretary of war 1929-33; first U.S. minister to New Zealand 1942-March 1943; made F. D. Roosevelt's representative in Middle East March 1943.

Hurley, Irish name for hockey H-314

Huron, or Wyandot, tribe of Iroquoian Indians originally living in Ontario along Georgian Bay; driven

into upper peninsula of Michigan; later into lower peninsula and Ohio Kansas City, Kan., settlement K-6

Huron, S. D., distributing center for agricultural and stock-raising region, 110 mi. e. of Pierre; pop. 10,843; Huron College: map S-218

Huron (*hū'rōn*), Lake, 2d largest of the Great Lakes H-362-3, G-146-50a, maps G-146a, 147

canals: Sault Sainte Marie S-31; Trent C-69, H-363

Detroit commerce D-57

height and depth, diagram G-146a

Huron College, at Huron, S. D.: Presbyterian; founded 1883 at Pierre as Pierre University; name and location changed 1898; collegiate and music departments.

Hurricane S-298

Caribbean Sea C-84, W-72c

Galveston G-3

Miami, Fla. (1926) M-145

Hurricane glass, globe for candlestick A-172

Hurst, Fannie (Mrs. Jacques S. Danielson) (born 1889), American short-story writer and novelist, born Hamilton, Ohio; educated at Washington and Columbia universities; gained knowledge of life through work in New York as actress, shop girl, waitress; first won success with short stories, particularly of Jewish life in America; later wrote novels ('Lummox'; 'A President Is Born'; 'Five and Ten') and plays ('Humoresque'; 'Land of the Free'); work shows strength but has crudities and mannerisms.

Hurston, Zora Neale (born 1901), Negro author, born Eatonville, Fla.; vivid stories of Negro life ('Jannah's Gourd Vine'; 'Mules and Men'); studied voodoo rites in the West Indies, on Guggenheim Fellowship ('Tell My Horse').

Husein, grandson of Mohammed. *See in Index* Hasan and Husein

Husein Ibn Ali (*hū-sin' ib'n ā'lē*) (1856-1931), first king of the Hejaz and recognized by Mohammedans as senior descendant of Mohammed; for services with British troops during World War, made king of Hejaz 1916; calif 1924; six months later overthrown; retired to Cyprus; succeeded by his son Ali Ibn Husein (born 1878) who ruled until 1925. His second son, Abdullah Ibn Husein became amir of Trans-Jordan and his third son, Faisal, king of Iraq: A-240

Husein Kamel (1854-1917), named sultan of Egypt in 1914 by Great Britain E-201

Hu Shih (*hū'shē*) (born 1891), Chinese philosopher and writer; ambassador to U. S. 1937-42; dean of School of Literature, Peking University; edited *Endeavor* and *Independent Critic*; reformed Chinese classical language into "pai-hau" ("clear talk") made high adviser to Chinese cabinet Sept. 1942: C-221g

"Huskies," Eskimo dogs D-78, 82

Husking bee P-221f, picture U-239

Huss, Henry Holden (born 1862), American pianist and composer; with his wife, Hildegard Hoffman, soprano, gave recitals; composed piano and violin concertos, songs, and choral works.

Huss, John (about 1369-1415), Bohemian religious reformer and martyr H-363

John Huss Day H-322

Hussar (*hū-zār*), light-horse cav-

alry-man; type originated in Hungary in 1458; from Magyar word *husz*, "twenty," because in levying troops one out of every 20 men was taken.

Hussein. *See in Index* Husein

Hussey, Obed (1792-1860), American inventor, born in Maine; sailor in early life; invented corn grinder, sugar cane crusher, and machine for making pins; rival of Cyrus H. McCormick as inventor and manufacturer of the reaper: M-3

Hus'site Wars (1419-34) H-363

Hutchins, Robert Maynard (born 1899), American educator, born Brooklyn, N. Y.; before appointment as president of University of Chicago at age of 30 had been dean of Yale Law School.

Hutchinson, Anne (1600?-43), American religious leader, born England; banished from Massachusetts colony because of religious teachings; founded a colony in Rhode Island where no one would be "accounted a delinquent for doctrine"; later removed to New York where she was killed by Indians: A-154

Hutchinson, Arthur Stuart Menteth (born 1879), English novelist, born India ('Once Aboard the Lugger'; 'The Happy Warrior'; 'If Winter Comes'; 'This Freedom'; 'One Increasing Purpose').

Hutchinson, Thomas (1711-80), Tory governor of province of Massachusetts and historian, born Boston, Mass. ('History of the Colony of Massachusetts Bay') quoted A-16

Hutchinson, Kan., manufacturing city on Arkansas River, 42 mi. n.w. of Wichita; pop. 30,013; salt, flour, fiber products; wheat, poultry, and cream center: map K-4

Hutch-table A-170

Hutten (*hūt'en*), Ulrich von (1488-1523), German humanist reformer, poet, and satirical writer, author of notable Latin verse; member of Luther's party in Protestant Reformation.

Hutton, James (1726-97), Scottish landowner and geologist; propounded modern view that existing land forms were developed gradually by processes that are at work today ('Theory of the Earth').

Huxley, Aldous (born 1894), English writer, grandson of Thomas H. Huxley and nephew of Mrs. Humphry Ward; brilliant satirist; novels 'Antic Hay', 'Chrome Yellow', 'Point Counterpoint', and 'Eyeless in Gaza' present chaotic picture of pettiness and futility of life among disillusioned modern sophisticates; also wrote 'On the Margin'; 'Do What You Will', essays; 'Leda', poems; and a play, 'The World of Light'.

Huxley, Julian (born 1887), English biologist and writer, brother of Aldous ('The Stream of Life'; 'Religion without Revelation'; 'The Uniqueness of Man').

Huxley, Thomas H. (1825-95), English biologist, educator, and essayist H-363-4

Huygens (*hū'gēnz*, Dutch *hoi'gēns*), Christian (1629-95), Dutch mathematician, astronomer, and physicist; applied pendulum to the clock; improved the telescope, and discovered a satellite of Saturn wave theory of light L-128

Huygens, Sir Constantijn (1596-1687), Dutch poet, one of ablest in Dutch language; sent to Venice and

- twice to London on diplomatic missions; friend of John Donne; knighted by James I.
- Huysmans** (*ü-ës-mäns'*), Joris Karl (1848-1907), French realistic novelist, a master of psychological analysis ('A rebours'; 'En route'; 'La Cathédrale'; 'En Ménage'; 'La-bas'): F-197
- Hwang Hai** (*hwäng-hi*). See in Index Yellow Sea
- Hwang River**, Hoang Ho, Hwang Ho, or Yellow River, 2d largest river in China (2700 mi.): H-364, C-211, maps C-211, A-332a, b-c dikes, repairing, picture C-221m
- Hyacinth**, or ja'cinth, a transparent yellow, red, orange, or brown variety of zircon used as a gem; also a yellow or cinnamon garnet. The hyacinth of the ancients was probably a sapphire: M-184
- garnet G-28
- zircon G-29
- Hyacinth**, plant of the lily family with flowers clustered into spikes H-364-5
- Hyacinth-bean**, a stout twining annual garden plant (*Dolichos Lablab*) of the family *Leguminosae*; large deltoid-ovate leaflets; profusion of purple flowers and pods.
- Hyacinthe** (*ë-ä-sänt'*), Père. See in Index Loyson, Charles
- Hyacinthus**, in Greek mythology, beautiful youth accidentally killed by Apollo H-364
- Hyades** (*hi'd-äz*), a V-shaped group of stars contained in the constellation Taurus; includes bright red star Aldebaran: chart S-275h
- Hyatt**, Anna Vaughn (Mrs. Archer M. Huntington) (born 1876), American sculptor, born Cambridge, Mass.; work includes animal sculptures, equestrian statues, and a few figure pieces ('Jeanne d' Arc').
- Hyatt**, John Wesley (1837-1920), American inventor, born Starkey, N.Y.; probably his greatest contribution to science was a method of purifying large bodies of water invents celluloid C-122, P-245i
- Hybrid**, a plant or animal produced by cross-breeding H-283b
- animals
- cattle C-105; catalo B-151, C-105, picture C-106
- mule H-345, picture H-344
- plant life P-245d-e, f
- Burbank's work B-276, pictures B-277
- corn C-367
- flowers: Shasta daisy D-5; tea rose, picture R-157
- fruits F-211: Bartlett plum P-260; limequat L-138; loganberry L-180, R-51; pears P-95; plumcot B-276; raspberry R-51
- wheat W-82
- Hycar**, rubber-like substance R-170
- Hydas'pes River**. See in Index Jhelum River
- Hyde**, Arthur M. (born 1877), U. S. secretary of agriculture under President Hoover; born Princeton, Mo.; governor of Missouri 1921-25; in law practise after 1933.
- Hyde**, Douglas (born 1860), Irish scholar and author, made first president of Eire 1938; well known for his work to make Gaelic a living language; president of Gaelic League, of which he was one of founders, 1893-1915; wrote 'A Literary History of Ireland'; translations from Gaelic, and plays.
- Hyde**, Edward. See in Index Clarendon
- Hyde**, William DeWitt (1858-1917), American educator and writer, born Winchendon, Mass., ordained as Congregational minister 1883; president Bowdoin College 1885-1917, and professor of mental and moral philosophy ('Practical Ethics'; 'Practical Idealism'; 'Self-Measurement'; 'The Quest of the Best'; 'The Five Great Philosophies of Life').
- Hyde Park**, London L-189
- Hyderabad**, important native state of India; 82,698 sq. mi.; pop. over 14,400,000: H-365, map I-31
- Hyderabad** (*hi-dër-ä-bäd'*), capital of Hyderabad state, India; pop. 470,000: maps I-30, A-332c
- Hyder Ali** (*hi'dër ä'lë*) (1722?-82), Indian ruler and commander, most formidable Asiatic rival of British in India
- power broken by British H-234
- Hydra**, in Greek mythology, nine-headed monster slain by Hercules H-282
- Hydra**, a primitive water animal H-365-6
- Hydrangea** (*hi-drän'gë-ä*) H-366
- Hydrargyrum**, Latin and chemical term for mercury, or quicksilver.
- Hydrate**, a substance containing one or more entire molecules of water in chemical combination.
- Hydraulic brakes** B-225
- Hydraulic cement**, any cementing substance which hardens after wetting
- portland cement C-124-7
- Hydraulic dredge**, one that excavates under water by suction D-105
- Hydraulic elevator**, one that operates by hydraulic power E-250-1
- Hydraulic engineering**, a branch of civil engineering. See in Index Aqueducts; Artesian wells; Dam; Dike; Dredge; Harbors and ports; Irrigation and reclamation; Levee; Lock; Turbine; Waterworks; also headings beginning Hydraulic
- Hydraulic lift lock**, picture O-227
- Hydraulic machinery**, machinery which uses water as a power source or to apply power to work H-366-8
- automobile brake A-403
- elevator E-250-1
- press H-368, picture H-367: book-making B-186; steel industry I-144
- ram H-366, picture H-367
- water turbines W-51-2, T-156, pictures W-51, 52
- water wheels W-51-2, pictures W-43
- Hydraulic mining**, excavation of surface ore by washing down with powerful streams of water G-112, pictures A-102, F-114
- Hydraulic organ** O-250
- Hydraulic press** H-368, picture H-367
- book-making B-186
- steel industry I-144
- Hydraulic ram** H-366, picture H-367
- Hydraulics**, the science of force and motion in liquids H-368, P-193, Outline P-196. See also in Index headings beginning with Hydraulic
- Hydro-airplane**. See in Index Sea-plane
- Hydrocarbons**, large class of compounds of hydrogen and carbon C-176a
- aromatic, or benzene, series C-174, B-97
- candle flame combustion B-272-3
- fats and oils F-18-19
- illuminating gas contains G-22
- petroleum and derivatives P-148-9
- Hydrochloric acid**, or muriatic acid, an acid composed of hydrogen and chlorine H-368
- antidote F-64
- aqua regia contains G-114
- copper refining C-359-60
- electrolytic decomposition E-239
- equivalent and molecular weight A-10
- etching, metal E-295
- gastric juice contains H-368, S-292
- gelatin and glue making G-25
- ionization A-9
- Le Blanc soda-making process S-190
- Hydrocyanic acid**, or prussic acid, a poisonous compound of hydrogen, carbon, and nitrogen C-418-19
- causes instant death P-275
- dangerous as fumigator A-223
- Hydroelectric power**, electricity from generators driven by water power W-49-52, T-156. See also in Index Water power
- Canada W-51, C-52, 54, picture, C-51: British Columbia V-271; Ontario O-226, O-254; Winnipeg W-114
- Claude's undersea tube P-339
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- Europe E-276
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- Hydro-extractor**, a centrifugal machine used in laundries to extract water from cloth L-71
- principle of machine C-134
- Hydrofluoric acid**, a compound of hydrogen and fluorine (HF) etches glass C-223, G-104
- Hydrogen**, the lightest chemical element H-368, C-174, table C-168
- acids all contain A-9
- ammonia formed from, by catalysis C-172
- atomic structure A-361
- atomic weight A-361, C-167b
- balloons buoyed by B-22, 26
- carbohydrates C-176b
- chemical symbol H-368, C-167a
- discovery C-178
- earth's crust, diagram C-167
- electric batteries form E-214
- electrochemical activity and reactions E-239
- electrolysis produces, picture C-166
- flame: hottest known H-368; invisible F-46
- hydrocarbons C-176a
- illuminating gas contains G-22, 23
- ion, concentration A-10
- ionization in solution E-225
- isotopes C-169
- lightness, comparative G-18
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- molecular weight C-167b
- "ortho" and "para" forms C-169
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- sulphide C-175
tungsten purified by, *picture* C-180
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water formation, H-368, W-46, *diagram* C-170
- Hydrogenation**, a chemical process for increasing hydrogen content of oils H-368
gasoline P-149-50
oil and gasoline from coal C-288
- Hydrogen chloride** H-368. *See also in Index* Hydrochloric acid
- Hydrogen ion concentration** A-10
- Hydrogen peroxide** or dioxide, a compound (H_2O_2) of hydrogen and oxygen, strongly disinfectant, used for cleansing and bleaching
- Hydrogen sulphide**, or sulphuretted hydrogen, a vile-smelling, poisonous, gaseous compound of hydrogen and sulphur (H_2S) C-175
bacterial action B-13
- Hydrogen welding** W-70, H-368
- Hydrographic Office, U.S.**, a branch of the Bureau of Navigation, U.S. Department of the Navy U-226
iceberg charts I-4
- Hydrographic surveying**, surveying of oceans, lakes, and rivers S-332
- Hydrologic cycle**, or water cycle W-42a-43
relation to flood control F-106a
soil conservation and E-145j-46
- Hydrolysis**, decomposition by a chemical process A-10
corn starch C-368
glucose G-107
sugar S-323
- Hydrometer**, instrument for determining density of liquids H-369
- Hydrophobia** (*hi-drō-fō'bi-ā*), or rabies, disease caused by an unknown virus in saliva of infected animals and transmitted by bites: G-78, 80
Pasteur treatment P-86
protection against H-257
"Hydrophobia skunk" S-157
- Hy'drophone**, device for listening under water; used to detect submerged submarines: S-314
- Hydrophyllaceae** (*hi-drō-fi-lā'sē-ē*). *See in Index* Water-leaf family
- Hy'drophytes**, plants which require great moisture, as contrasted with those that require only moderate moisture (mesophytes) and desert plants (xerophytes): W-49
- Hy'droplane**, an airplane which may rise from or land upon the water, a seaplane. *See in Index* Seaplane
- Hydroplane**, a type of boat B-165, M-291
- Hydropon'ics**, soilless gardening, also called water gardening P-245f-i
- Hy'drosphere**, the water on the earth E-132
- Hydrostat'ic paradox**, the seemingly impossible arrangement by which a small weight or force can be made to support a very large weight or exert a large force
illustrated by hydraulic press H-368, *picture* H-367
- Hydrostatic press.** *See in Index* Hydraulic press
- Hydrostatics**, a branch of hydraulics dealing with pressure and other phenomena in liquids at rest. *See in Index* Liquid
- Hydrot'ropism**, the tendency of plant structures to grow toward water P-242
- Hydrox'ide**, a compound containing one or more elements in combination with hydroxyl (OH)
alcohols C-176b, A-112
alkalies A-9, A-128
bases A-9, E-239
- calcium L-138
electronegative charge A-10
lithium A-128
phenol (carbolic acid) C-176a
potassium P-323, 324, A-9, A-128
sodium S-189, A-9, A-128
- Hydroxyl**, one atom of hydrogen and one of oxygen united (OH) and forming hydroxides with other elements or compounds. *See in Index* Hydroxide
- Hydrozo'a**, a class of coelenterates, including the hydra, the hydroids or "zoöphytes," and the Portuguese man-of-war.
- Hyena** (*hi-ē'nā*), a dog-like carrion-eating animal H-369
- Hyena dog**, African hunting dog, *picture* A-33
- Hygeia** (*hi-gē'ā*), in Greek mythology, goddess of health H-370
- Hygiene** (*hi'gēn*) H-370-6, *Outline* P-207-9. *See also in Index* Medicine and surgery; Physiology; Public health; and chief subjects listed below
alcohol, effect on health A-112
antiseptics and disinfectants A-222-3
athletics A-355-6
baby care B-1-4
baths H-376
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camp sanitation C-47a-b
care of the body, *Outline* P-208
Child Health Day H-320
clothing H-376
colds, avoiding H-375
conservation of health C-344
diet F-144-6, H-372-4: complete requirements H-372; excess fat, storage F-145; meals per day H-373; weight control H-372-3
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humidity and health H-264
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mental hygiene M-118, H-376
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vitamins V-310-12, F-146, H-372
water supply W-55-6
weight, in youth and age F-145, H-372
work and fatigue W-147-8
- Hygrom'eter**, instrument for measuring moisture in air H-377, *pictures* H-377, W-60b
- Hyksos** (*hik'sōs*), or Shepherd Kings, dynasty of foreign rulers of Egypt E-206
- Hyla** (*hi'lā*), the tree-frog F-209, *picture* F-207
- Hymans** (*ē-māns'*), Paul (1865-1941), Belgian statesman; delegate to Peace Conference, 1919, and various international meetings; president first assembly of League of Nations; minister to Great Britain; minister foreign affairs.
- Hy'men**, in Greek mythology, god of marriage
ivy on altar I-176
- Hymenop'tera**, an order of insects having four membranous wings and mouthparts fitted for both chewing and sucking; includes bees, wasps, ants, sawflies, and ichneumon flies.
- Hymen Terrace**, Yellowstone National Park, *picture* Y-205
- Hymet'tus**, Mount, peak of Attica, bounding Athenian plain on s.e.; 3370 ft.; marble quarries; famous for honey in ancient times: A-353
- Hymn**
Addison's A-18
development of hymn writing M-317
early history, origin of tunes M-309
Muse of M-305
national N-24-7
Wesley W-72
- Hynd'man**, Henry Mayers (1842-1921), English socialist; founded the Social Democratic Federation in Great Britain; defended free institutions, particularly in Ireland and India.
- Hyndman Peak**, a mountain peak in s. cent. Idaho in Sawtooth Mt. range (12,078 ft.).
- Hyoid bone**, a small U-shaped bone in the base of the tongue; attached by ligaments to temporal bone, and serves as attachment for muscles used in swallowing.
- Hyoscyamus.** *See in Index* Henbane
- Hyoscine.** *See in Index* Scopolamin
- Hypatia** (*hi-pā'shi-ā*) (370?-415 A.D.), a Greek woman mathematician and philosopher famed for her beauty and wisdom; head of Neoplatonic school at Alexandria; murdered by Christian mob; the heroine of Kingsley's 'Hypatia'.
- Hyperbola**, a plane curve so drawn that any point on it is distant from two fixed points called foci, by a difference which is constant for all points. *See also* Conic sections
- Hyperbole** (*hi-pēr'bō-lē*), a figure of speech F-32-3
- Hyperbo'reans**, in Greek mythology, a "blameless" people dwelling in a land beyond the north wind, a paradise of perpetual youth; connected with worship of Apollo.
- Hyperion** (*hi-pēr'i-on*), in Greek mythology, a Titan, father of Helios the sun-god; later, sometimes the sun-god himself.
- 'Hyperion'**, story by Longfellow L-192
- Hypermetamor'phosis**, the type of insect growth in which the larva undergoes more than one transformation before becoming a pupa
blister beetle B-84
- Hypermetro'pia**, far-sightedness E-352, S-240
- Hyphen**, use of P-368
- Hypnos** (*hip'nōs*), in Greek mythology, god of sleep corresponding to Roman Somnus.
- Hypnotics**, narcotics used to produce profound sleep N-12
- Hyp'notism** H-377-8
- Hy'po**, photographers' trade name for sodium thiosulphate ($Na_2S_2O_3$)
action as "fixer" in developing photographs P-183

ü=French u, German ü; gem. *go*; thin, then; ñ=French nasal (Jean); sh=French j (*z* in azure); κ=German guttural *ch*

Hy'pocaust S-304
 Hy'pocotyl, embryo stem bean, *picture* B-66
 Hypogas'tric plexus, network of nerves in abdomen P-207
 Hypophysis (*hi-pōf'i-sis*), the pituitary gland B-221, *picture* B-220
 Hyposul'phite of sodium, a salt of sodium and hyposulphurous acid ($\text{Na}_2\text{S}_2\text{O}_4$); often confused with sodium thiosulphate, the photographer's "hypo": S-190
 Hypothalamus, in brain B-221, *picture* B-220
 Hypoth'esis, in geometry G-50
 Hyracol'dea, an order of small ungulate mammals, comprising only

the conies or rock rabbits Z-229
 Hyrax, or rock rabbit Z-222
 Hyrcanus I (*hēr-kā'nūs*), John (died 105? B.C.), high priest of Jews; under his rule Judea gained tremendously in power and independence, completing an advantageous alliance with Rome and conquering Syrians and Samaritans.
 Hyrcanus II (died 30 B.C.), high priest of Jews, grandson of above; ruled at intervals from 69 to 40 B.C.; incompetent ruler; finally put to death for treason.
 Hyslop, James Hervey (1854-1920), American psychologist, in later years active in study of Spiritual-

ism; born Xenia, Ohio; professor of logic and ethics at Columbia University 1895-1902; editor, *Journal of American Society for Psychological Research* ('Science and a Future Life'; 'Life after Death').
 Hy'son tea, a kind of green tea, *picture* T-22
 Hyssop, a perennial garden herb (*Hyssopus officinalis*) of the mint family with spikes of small blue flowers; tea made from leaves formerly used in treatment of various pulmonary diseases. The hyssop referred to in the Bible, used for sprinkling purposes, is a different plant, probably a tropical member of pokeweed family.